School Shop

vol. IX no. 10

JUNE, 1950

Industrial Arts from Coast to Coast
by Gordon O. Wilber

Shop Math Made Easy
by Ira C. Madden

Solving Gear Dimension Problems
by John W. Titus

Let Students Help
by Fred Finsterbach

On the cover: Visual aids are a necessity for efficient learning. See page 8 for a description of their use in mathematics.

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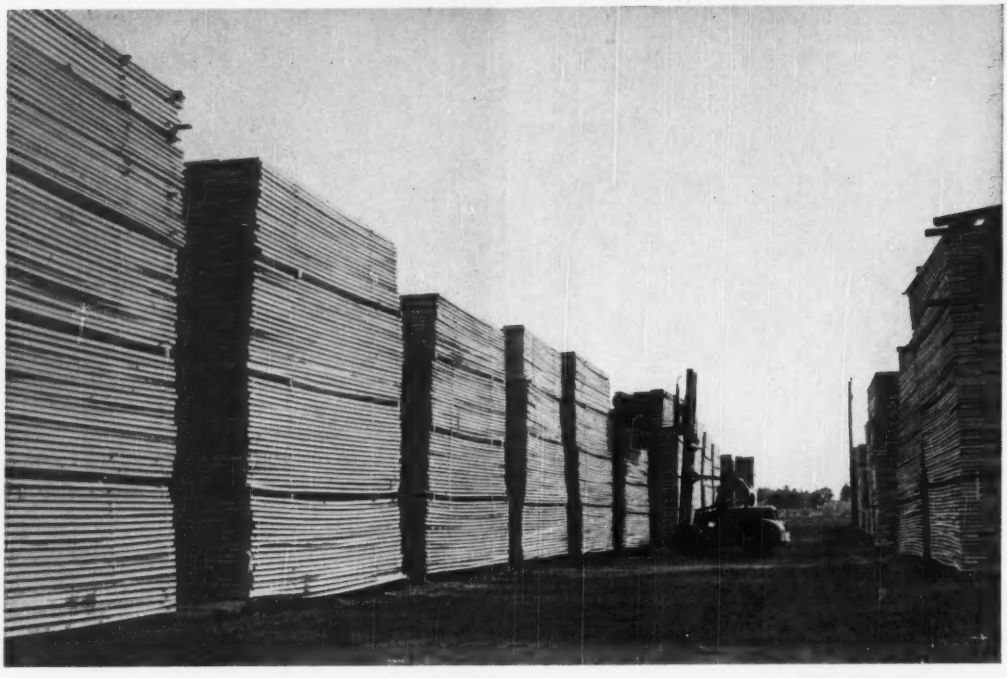

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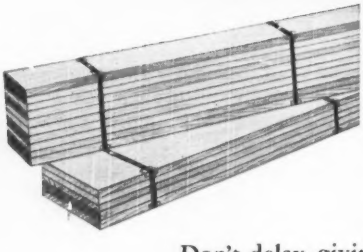

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School Shop

FOR INDUSTRIAL EDUCATION TEACHERS

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School Shop TALK

COMMENTS ON ISSUES FACING INDUSTRIAL EDUCATION

What Ails Apprenticeship-Training?

Every once in a while it is a good idea to reexamine our programs of education in the light of their performance. This, it seems to us, is a particularly good time to look into the whole question of apprentice training. Judging by the headline over this editorial, the reader will say, SCHOOL SHOP must think something ails it. Yes, we do. But we do not believe it is anything so serious that a little realistic appraising and revising will not cure.

An official of the U. S. Department of Labor's Bureau of Apprenticeship told an audience of the Kentucky Society of Training Directors the other day that skilled craftsmen were being replaced in industry at a rate of only 50 percent on the average. This means, we take it, that when a skilled worker dies, is retired, or moves away, there is an apprentice ready to move into his shoes in only half the cases. Not only that, but he cited a recent survey that showed that out of 400,000 establishments which had facilities for the training of apprentices only 150,000 have registered programs of such training. This official, W. F. Patterson, was speaking on "Government's Interest in Training Skilled Workmen." But what he had to say has application to our whole industrial complex. And it points the finger at those who are charged with preparing apprentices to take over skilled jobs.

All of us in industrial education feel (or should feel) that our main job is the service of young people. Imparting skills and technics is one way we perform this service. Another way is in the dissemination of job information—we are always in the role of guidance person. All this relates to the question of how industrial education can help out in the situation to which Mr. Patterson alludes. We can help increase the number of apprenticeships, help to change that 50 percent replacement figure to nearer 100. It requires some soul-searching and perhaps some changes in our operations.

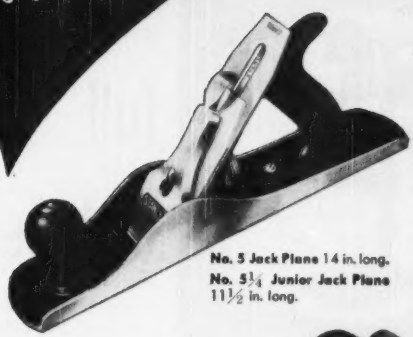
Industrial education can help out by reexamining our programs of vocational education to determine if they are realistic in terms of job opportunities. Are we meeting the demands of workers who would like to spend off-time in course work that would aid their upgrading? Are we following blindly some program of specific job training in our all-day classes when few jobs are awaiting those who finish such courses? Might it not be better if we instituted course work which included *families* of occupations based on a realistic appraisal of local job markets? A recent report of the USOE's Division of Vocational Education shows that in 1948 attendance at evening and general continuation trade and industry courses was on the upgrade and all-day and part-time courses were declining. Administrators should plan on the basis of this and other information to revise their programs where necessary to meet the demands of the particular groups served by these courses.

Most coordinators are doing a splendid job in keeping established apprentice programs going. The inauguration of new programs is not so easy and the tendency is for coordinators to shy away from the tough job of convincing labor groups, employers, and potential students that a new apprentice program should be started. It is a long uphill pull in many cases. Many trades have archaic apprenticeship procedures. But the job must be done if we fulfill our obligation to the nation's youth.

Increasing the quantity of apprenticeships can have little meaning unless we make steps to increase also the quality. Any reexamination of existing vocational programs should include some study of the effectiveness of the programs in terms of producing craftsmen. What are we doing to restore skill and artistry to the high place they once held? Industry will reward the skilled craftsman and, more important, the conscientious skilled worker will have his own self-respect. It is up to us to see that this skill is brought out and guided into channels in which it can do the most good.

This sounds like a large order. But it can be done. Vocational education should view the facts presented in Mr. Patterson's address as a challenge. We can help secure for our young people rungs on the apprenticeship ladder. We can revise the replacement figure upward. We owe it to the students and to democratic society, for, to quote Mr. Patterson, "The free world looks to America for leadership and America must look to her skilled labor force to maintain this leadership."

teach with good tools



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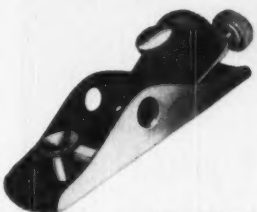

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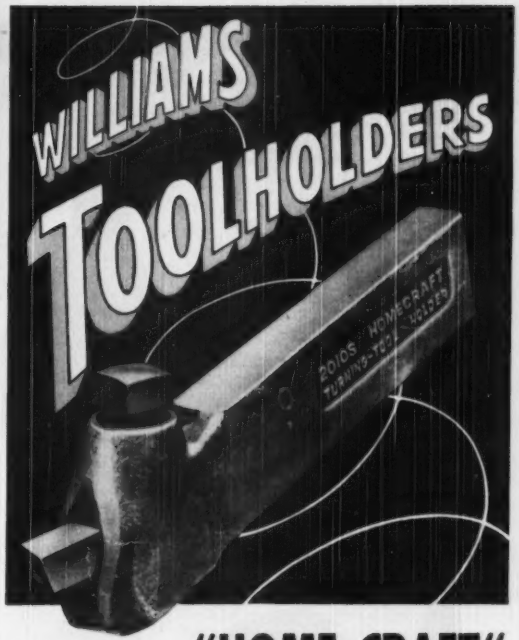

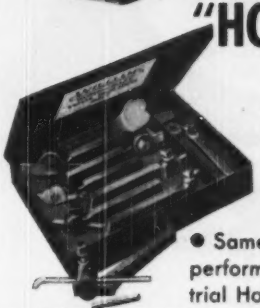

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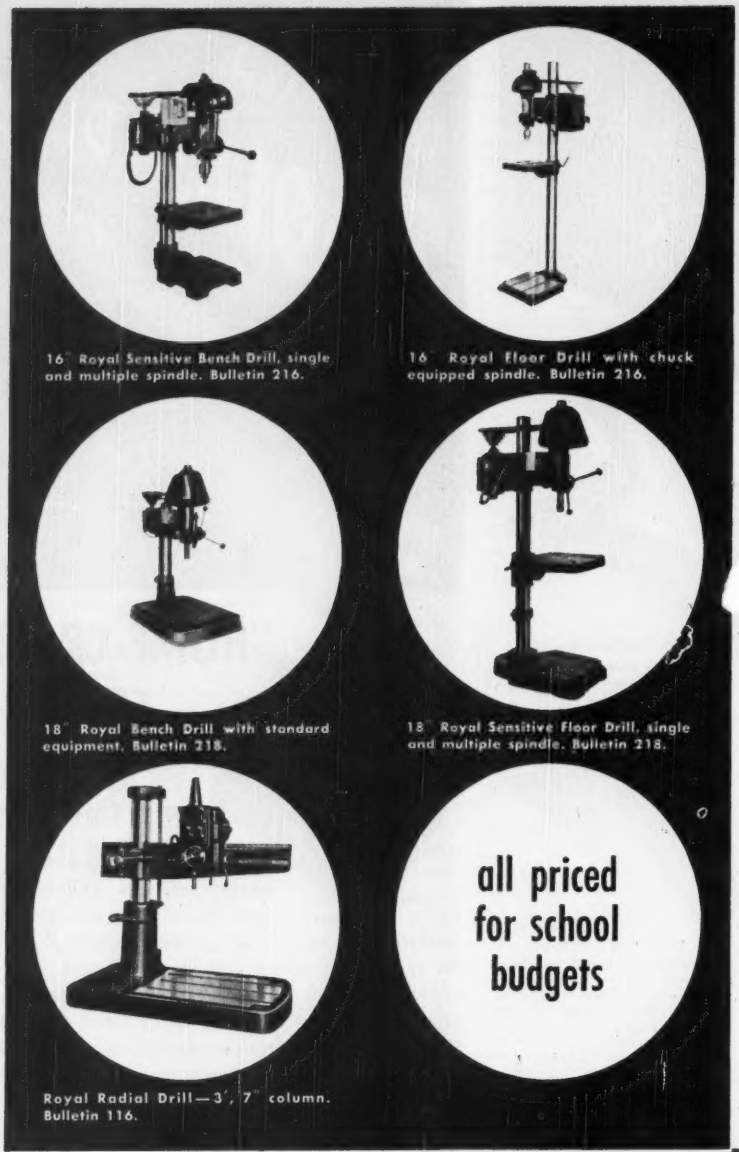
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Industrial Arts
as seen from coast to coast

By Gordon O. Wilber

The way to find out what sort of programs are being offered in schools preparing teachers of industrial arts is to visit them, said Dr. Wilber, Director of Industrial Arts at Oswego, N. Y., State Teachers College. So, he did—in a journey lasting several months, covering around 12,000 miles, and including 40 schools. Here is his report.

IT has been the privilege of the writer during the past five months, to visit 40 of the leading colleges and universities which prepare industrial-arts teachers. This trip stemmed from a desire to learn at first hand how industrial-arts teachers were being trained in other institutions, and to gather ideas for the improvement of my own program. Because it is realized that every person who has responsibility for directing a training program probably would like the opportunity to take such a trip, it seems expedient to record some of the observations made.

The Itinerary

Plans and preparations for the trip began almost a year before the starting date. Of the more than a hundred colleges and universities listed as offering a program for the preparation of industrial-arts teachers, it was necessary to choose the number that could conveniently be visited in the time available. It was gratifying that each of the 40 colleges contacted replied immediately that it would be happy to be visited.

The final itinerary called for a trip of nearly 12 thousand miles across the northern part of the country, down the West Coast and back through the southern and central sections.

In addition to the 40 colleges and universities, many public schools were visited, notably in Detroit, Mich.; Muncie, Ind.; Spencer, Iowa; Santa Barbara, Calif.; and San Antonio, Texas.

What to Look For

Because it is so easy to lose sight of significant aspects of a school's program through looking at details, the decision was made before starting to give particular attention to specific features at each institution. Important among such features were: (1) physical plant, (2) requirements for major and/or minor, (3) usual combinations of majors and minors, (4) cadet-teaching practices, (5) breadth and richness of offering, (6) opportunities for students to learn to think and plan, (7) evidences of a functional personnel system, and (8) evidences of interest in recreational aspects of industrial arts.

Physical Plant

The status of industrial arts can, to some degree, be judged by the provisions made for training its teachers. It is interesting to note, therefore, that the writer found only a few colleges and universities where it was felt that adequate provision had been made by way of buildings and equipment. California, Pa., State Teachers College was the first school visited which appeared to rate well in this respect. With a comparatively new building and good equipment this institution certainly ranks well up at the top in the nation. Illinois may be congratulated on having two excellent schools judged from this standpoint—at Eastern State College and at Northern State Teachers College. Both have relatively large and well equipped buildings primarily devoted to industrial-arts programs. Platteville, Wis., State Teachers College has a relatively new building which, for its present enrolment, appears to be entirely adequate.

I found a fine new building at Iowa State Teachers College which is occupied jointly by industrial and fine arts. When entirely completed and organized this should be one of the show places of the Midwest.

The next physical plant which appeared to be thoroughly satisfactory was at the University of California at Santa Barbara. This beautiful building overlooking the Pacific Ocean is undoubtedly the most nearly perfect physical plant visited. It is interesting to note, also, that the equipment at Santa Barbara is no less adequate than the building.

At several other schools, the writer saw excellent buildings and equipment, but because of the fact that they were used jointly for the training of engineering students and industrial-arts teachers they are not included here. It is felt, on the basis of many programs observed, that when the attempt is made to utilize the same laboratories and shops for the training of two or more diverse groups, so many compromises in equipment and organization become necessary that it is impossible to say that the situation is adequate for industrial-arts training.

The national picture as regards physical facilities for industrial-arts teacher education is far from being as dark as the preceding paragraphs would indicate, however. One of the most gratifying experiences which the writer had was the discovery that at almost every stop new buildings were in the process of construction, being started, or being planned. A fine, new industrial-arts plant is nearing completion at Ball State Teachers College, Muncie, Ind. When finished and equipped it will rank among the best in the country. At the time of the writer's visit ground was being broken for a new building at Kent, Ohio, State University and for an addition to the present structure at Miami University, Oxford, Ohio. Plans indicate the state will be justly proud of these two plants when completed.

In addition, the writer saw plans for new buildings or additions to present quarters at Pennsylvania State College, Wayne University, Indiana State Teachers College, Illinois State Normal University, Bradley University, Stout Institute, University of Minnesota, Wayne, Neb., State Teachers College, Colorado State College of Education at Greeley, Chico, Calif., State Teachers College, San Jose, Calif., State Teachers College, Southwest Texas Teachers, Texas A. & M., University of Missouri, Southern Illinois State University, and at Virginia Polytechnic Institute.

On the Future: ". . . the writer returns home with the firm conviction that the industrial-arts profession is definitely looking forward . . . . Some of the pressing problems appear to be the need for greater breadth and richness in laboratory experiences for prospective teachers, a greater emphasis on teaching students to think and plan, a concerted effort to encourage industrial arts at the elementary level, and also to make industrial arts available to girls as well as boys."

Every indication points to the fact that, at last, industrial-arts teacher education is coming out of the cellar. Five or ten years hence, if one were to take a trip similar to the one being described, the picture as regards the adequacy of physical plant and equipment should be much brighter than is at present the case.

Requirements for Majors and Minors

An almost unbelievable variation exists in the number of semester or quarter hours of preparation required for certification to teach industrial arts in the public schools. At least one instance was found where a maximum of 24 semester hours might be taken in industrial-arts subjects. At the other extreme, some schools required a minimum of 60 hours. The 40 schools visited ranged between these limits.

The number of hours required for a teaching minor in industrial arts varied somewhat less than for the major. Not all states permit the minor in industrial arts, but in those states that do, the requirement ranged from 16 to 30 semester hours.

An analysis of these requirements explains, in part at least, the reason for wide variations in practices in the public schools. One could hardly expect the teacher with only 16 or even 24 semester hours in industrial arts to promote the broad, rich program which seems to be required to meet present-day objectives of industrial arts. It is little wonder that one finds a predominance of woodworking and drawing in the public schools since for many teachers these are the only areas in which they have had experience.

Usual Combinations of Majors and Minors

There is considerable evidence that the effectiveness of an industrial-arts teacher is conditioned by the other subjects which he is required to teach. The reason for this conditioning seems related to the fact that, in order to do an adequate teaching job, an industrial-arts teacher must invest many hours outside of school time in the upkeep and organization of his shop, in the planning of new work and activities, in the ordering and procuring of supplies, and in the preparation of materials for class use. Any combination of duties with another subject requiring a similar amount of outside time, therefore, leads to neglect of essential activities and consequently a less effective industrial-arts program. It was of interest, therefore, to note the usual pattern of majors and minors being pursued by and recommended to those who were preparing for industrial-arts teaching.

In spite of the obvious incompatibility the most frequent combination was found to be industrial arts and physical education (which usually included coaching). This was particularly true in small schools where the industrial-arts teacher might be the only man on the faculty. It appears to be perfectly evident that, under such conditions, only a "super teacher" could promote better than a mediocre program of industrial arts.

The next most frequent combination appears to be with science or mathematics, while a combination with social studies or English was not uncommon. These appear to the writer to be much more desirable.

There is a growing tendency to assign the teaching of driver training to the industrial-arts teacher. In many ways this combination is similar to that with physical education. The road work expected in connection with driver training requires much time outside of school. Where this is the case, the industrial-arts program is likely to suffer. On the other hand, the industrial-arts teacher appears to be the logical person to teach driver training. The answer seems to be, therefore, to employ extra teachers for this work to a point where both programs can be operated effectively.

In some states the writer found the rather unusual situation of an industrial-arts teacher who also taught vocational classes. Under such circumstances it was necessary for the individual to meet certification requirements for both the subsidized and industrial-arts field. The writer found difficulty in determining from casual observation whether a given class was vocational or industrial arts. Considering the rather wide variance in the objectives for vocational and industrial-arts work there appears to be considerable question as to whether both can adequately be taught in the same shop by the same individual.

Cadet Teaching Practices

The evidence indicates that an adequate experience in cadet teaching results in maximum growth toward effective teaching, and that there is a close relationship between the experience which the student has in cadet teaching and the program which he will eventually promote. The writer, therefore, studied carefully the programs of cadet teaching in the various colleges, and, wherever possible, conditions at the school in which this teaching was done.

It is indeed interesting, and at the same time somewhat alarming, to note the wide diversity in practices. At one end of the scale one finds situations where the teaching is done in public schools carefully chosen for excellence in teaching and organization, and effectively supervised from the college. Under such circumstances, the student is usually assigned for a full semester or quarter. The advantages of such an arrangement which gives the student an opportunity to participate in all of the activities of the school and community are clearly evident.

At the other extreme, the writer found several colleges where the assignment and supervision of cadet teaching was entirely removed from the industrial-arts department. Indications are that under such circumstances students are

On Physical Plant: "Every indication points to the fact that at last industrial-arts teacher-education is coming out of the cellar. Five or ten years hence, if one were to take a trip similar to the one being described, the picture as regards the adequacy of physical plant and equipment should be much brighter than is at present the case."

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assigned without consideration for their needs, and since the supervision is usually done by one unfamiliar with industrial-arts methods and technics, it is doubtful if the full benefits of this experience can be achieved.

Between these extremes one finds all types of arrangements for meeting the cadet teaching requirement. The actual hour requirement ranges from three to 15 semester hours. In some schools the student may do as little as one class period for a semester while at other colleges he must devote a full half-day for a semester or more to this activity. Much of this difference stems from a variety of reasons, such as (1) the importance attached to cadet teaching by the administration, (2) the strong hold over the curriculum exercised by the liberal-arts faculty, (3) the facilities available for cadet teaching, and (4) the organization and funds available for supervision.

Apparently there is a trend toward increasing the amount of time devoted to cadet teaching and the amount of credit assigned to it. Several schools are now studying the possibilities of doing all or at least a large part of this work in the public schools on a full-time basis. These appear to be hopeful signs that eventually industrial-arts cadet teaching will be placed on a more practical and pedagogically sound basis.

Breadth and Richness of Offerings

Probably in no other respect do schools vary as widely as in the breadth and richness of their offerings. It is usually conceded that to meet the modern objectives of industrial arts the teacher must be adept in a wide variety of areas. It is of importance, therefore, to note not only the number and variety of shop or laboratory offerings, but also the extent to which any one student is permitted or required to sample them.

In this respect one finds a few large and long established institutions like Stout Institute; Santa Barbara, California, State Teachers; and Millersville, Pa., State Teachers College where a wide range of shops makes possible a rich and varied offering. At the other end of the scale are found colleges in which little more than a general woodworking shop and mechanical drawing is available. One notes also that many departments, especially in the larger universities, try to extend their offerings by utilizing the engineering shops for industrial-arts students. Careful observation seems to indicate that in many cases the colleges which have the widest variety of shops and are in the best position to promote a really rich and broad program are failing to make the most of their opportunities since they allow or require their students to specialize in one or two areas. This is undoubtedly the way to produce highly skilled craftsmen, but experience seems to show that teachers trained under such conditions tend to carry their narrow, specialized training into their junior- and senior-high-school classes. Hence, one finds a predominance of woodworking and drawing classes in the public schools rather than the broad program which would seem to be called for in all but the larger cities.

Another aspect of this problem of specialization relates to the relatively few colleges which include in their curriculums a comprehensive general shop. Many of the heads of departments, with whom the writer talked, readily agreed that the needs of their states could best be met by an extension of the general shop especially in the smaller communities. Despite this fact the training of teachers was done almost exclusively in unit shops. It is difficult to see how the general shop type of organization can be readily advanced under such circumstances "*for teachers tend to teach as they are taught.*"

It would seem, therefore, that immediate steps should be taken to organize and operate a general shop as one of the required areas in each of the colleges and universities in which teachers for this type of work are being prepared. It is interesting to note in this connection that at least two of the schools visited—the University of Missouri and Virginia Polytechnic Institute—have developed excellent general shops in which a major part of their technical preparation is carried on. It will indeed be surprising if teachers trained under such conditions are not much better fitted to organize and operate the broad program required for industrial arts than where the training is done in unit shops.

Opportunities to Learn to Think and Plan

Frontier thinkers in the field of education in general, and especially in industrial arts, have been placing increasing emphasis on the opportunities afforded by industrial-arts activities to encourage thinking and planning. For this reason I paid particular attention to evidences that future teachers were being trained in such a manner that they would naturally try to develop these abilities in their students. It may be assumed that if the prospective teachers in the colleges and universities are encouraged and required to do much of their own thinking and planning they will, in turn, require similar activities from their students.

It is encouraging to note that several schools are placing much emphasis along these lines. Several cases were found where students were required to develop or find the plans for their projects, and were then expected to plan rather fully and completely the procedure for making them. In some cases a specially prepared sheet was used to direct and organize the planning.

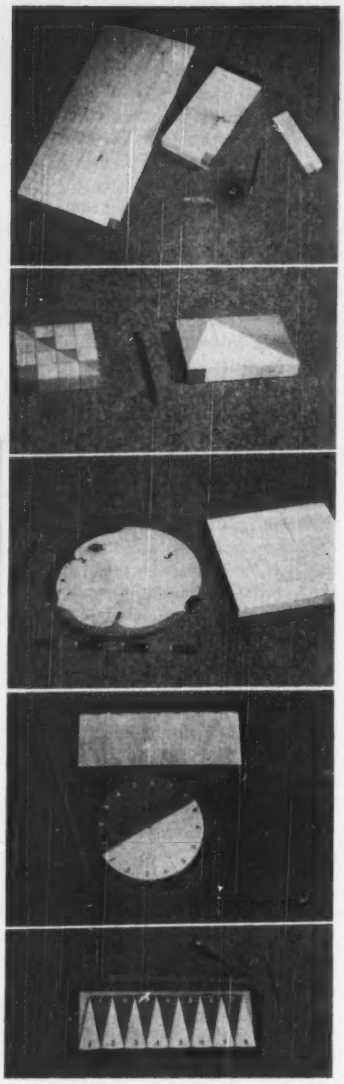
In other cases, however, the writer found evidence that students were required to make a predetermined set of projects or to do a prescribed series of jobs. In some instances these projects or jobs were completely preplanned by the instructor and given to the student in the form of job or instruction sheets, thereby precluding the possibility of any thinking or planning by the student. The justification for such practices seems to lie in the assumption that certain processes and operations are absolutely essential and must be mastered at all costs. There seems to be considerable doubt, however, that, for industrial-arts purposes, and when measured against the importance of learning to think and plan, any process or series of processes can be important enough to warrant the use of methods that might jeopardize more important outcomes.

Evidences of a Functional Personnel System

It has long been assumed that one phase of industry which industrial arts should explore is that of organization. To accomplish this end it has frequently been recommended that industrial-arts shops or laboratories be organized with a personnel system that would, to some degree at least, simulate the organization of industry. If teachers are to learn how to set up and operate such a system in their shops, it seems necessary that they have opportunities to observe and participate in such plans during their training period. The writer was interested to observe, therefore, the extent to which there were visible evidences of such organization in the schools that he visited.

While there were a few examples of very functional personnel plans in operation, the general picture is somewhat disappointing. Most of the shops had some form of clean-up schedule, but there was little evidence that it went beyond this point. Many mechanical and graphic devices were evident to assign and change duties, but the relationship of such devices to industrial practice was far from clear. Naturally,

(*Continued on page 30*)



1. Linear, surface, and board measure can be demonstrated with these easy-to-make devices. 2. A simple method for illustrating that half the base times the altitude equals a triangle's area. 3. The elusive concept of 3.1416 can be made real with this visualization of circumference. 4 and 5. All the necessary equipment for showing the formula for determining area of a circle.

Shop Math Made Easy with Visual Aids

By Ira C. Madden

You can overcome students' resistance to mathematics if you make it understandable, says this specialist in teaching devices. Ira C. Madden teaches industrial arts at the Angell School, Detroit, Michigan.

DURING my teaching experience, I have often found it necessary to give extra instruction in mathematics so that students can proceed intelligently with their industrial-arts courses. In too many cases I have found that they dislike mathematics; they say they don't understand it and therefore have lost interest. Because of this attitude, I have developed a series of visual aids that will help students to understand and remember the formulas. They *will be* interested if they understand how a formula is developed before attempting to solve problems. Being asked to memorize a formula without understanding the principle will confuse the worker when different types of problems are to be solved; also, in time, the pupils will forget the formulas and it will not be possible for them to work them out.

I have found, in talking to adults, that they also do not understand how we arrive at certain formulas. It therefore seems necessary for industrial-education teachers to do all they can to encourage students in mathematics, to help them not only in shop but in their regular mathematics. I have found that mathematics teachers are anxious to use these aids themselves in their teaching so it has created a fine cooperative feeling between teachers in the two departments. And superintendents are also most appreciative.

To Figure Linear, Surface, and Board Measure

Shop teachers will want to teach students to understand these three terms as it will help them to figure the cost of lumber used in the shop. They will also want to be able to estimate costs when planning a project for the home. Samples of moulding and dowel rod will help you to explain linear measure and to figure costs. A sample piece of plywood (photo no. 1) will make it easy for students to understand what a surface foot is. They can see that a surface foot can be any thickness but that it must be the equivalent of a piece 1′ wide and 1′ long; we could also say that it would be equal to 144 square inches. The visual aid will make it convenient for a teacher to prove that it is best to multiply the width in feet by the length in feet when figuring surface area. To figure board measure is quite confusing for many students as they can't see why we can multiply the thickness in inches by the width and length in feet. The piece 1″ thick, 12″ wide and 2′ long can be used to good advantage to teach this formula.

To Find the Area of Triangles

The visual aids on triangles will make it easy for students to understand why the area of a triangle is equal to one-half the base (width) times the altitude (length) as a triangle is just one-half of a square or a parallelogram.

To Find the Circumference of a Circle

It is important for students to know why we always multiply the diameter of a circle by *Pi* to figure the circumference. The device for proving this consists of a wooden disk 7″ in diameter and a thin flexible metal strip 7″ long; the strip is divided or graduated into inches. Using the flexible strip, measure off this distance around on the circumference and use different colors of enamel to represent each distance. Students can see objectively that the 7″ diameter strip will step itself off three complete times with an additional inch remaining, thus showing that the circumference is approximately three and one-seventh times as much as the diameter. It may be necessary to use an additional different-sized disk to convince students that this relationship is

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The author demonstrates the use of one of his own visual aids to illustrate the fact that the square of the hypotenuse in right-angle triangles is equal to the sum of the squares of the other two sides.

always the same regardless of the size of the circle.

To Find the Area of a Circle

It is possible for pupils to develop this formula if a device is used like the one in photographs 4 and 5. For this aid, cut out a disk of good quality plywood into 16 equal segments. Color eight of these segments; then take one of the eight uncolored ones and lay out a center line dividing it in two equal segments. Cut out a flexible piece of metal as long as half the circumference. Next, make a tray to hold the pieces as shown in the photograph. You can see that the lower edge of the tray is sawed out so the arcs of each segment will fit and that the length is equal to half of the circumference and the width of this arrangement of segments is equal to the radius. The one segment that was divided will complete the rectangular shape. The length of this is half the circumference or *Pi* times *r* and if multiply this amount by *r* (the width) would give us πr^2, which is the area of a circle.

The Pythagorean Theorem

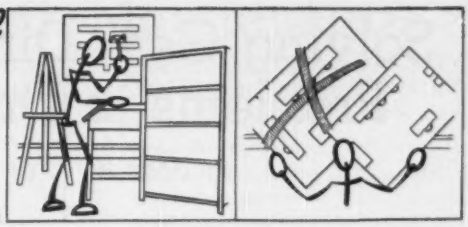
A device to demonstrate the Pythagorean theorem can be made quite easily. It consists of a wooden right-angle triangle and three wooden squares, the sides of which are respectively equal to the hypotenuse, the side adjacent, and the side opposite the acute angle of the right-angle triangle. These squares are then marked off in smaller squares of equal dimensions and dowel rods can be used to mount the squares. With this visual aid we can show our students that the square of the hypotenuse is equal to the sum of the squares of the other two sides merely by counting the squares in the two smaller blocks, adding them, and comparing the sum with the number of squares in the larger block. The squares are not to be fastened onto the triangle permanently as you will want to remove any one of the squares and ask your students to use the formula to figure the length of a side of the triangle.

The devices outlined above have been set up to meet the needs of industrial-arts classes at the junior-high-school level. However, the learning problems which surround mathematics seem to be met at all levels of age and competence. These aids and similar ones which can be devised by the shop teacher are very helpful.

These devices make correlation between work in the shop and in the mathematics classroom a natural step. It has been my experience that mathematics teachers welcome this tie-in with their work which results in a greater recognition of the value of shopwork by the other teachers in the school.

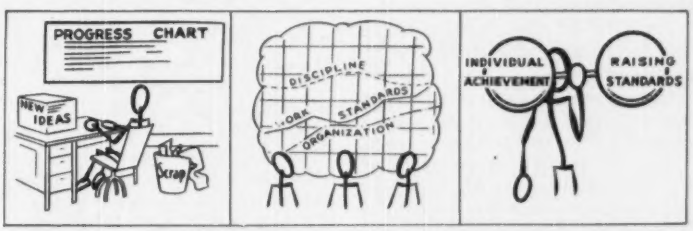
By James O. Proctor & G. Edward Griefzu

Department of Vocational Education
Baltimore, Maryland



REPAIR: Check your teaching aids. Develop new poster mountings, fresh charts, graphs, and demonstration pieces. Recatalog reference material. Put new hinges on the shaky easel and new handles on the tools. Check books and private folders for torn or dirty pages. Do the 101 little jobs that have piled up and need repair to become effective "teaching tools."

REARRANGE: Does your present shop or classroom represent the most effective layout for good teaching? A scale drawing of your floor space plus cardboard cutouts to scale of furniture and equipment will make rearranging an easy matter. Plan for effective lighting, maximum working space, and safety. A classroom or shop rearranged periodically often provides for more effective use of the area and makes for a more interesting place to work.



REVISE: Have all of your lessons and demonstrations "clicked"? Have you had any "duds" that could stand revising before teaching again? Is your course material modern? Have you included the latest technics in your teaching plans and presentations? Examine your units of work. Do they cover the subject in short, interesting steps or are they so inclusive that they have a tendency to lag? New progress charts and assignment boards often give a "lift" to your subject.

REVIEW: Have your efforts during the past year been effective, successful, and enjoyable? Have the students learned? Did they anticipate coming to your class or shop? Have you maintained high standards of work? Have you been too "soft" or too "tough" on the students? Do you need to brush up on any phase of your subject or course? Has it been a "good year"—if not, why not?—and what are you going to do about it

RESOLVE: In preparation for the next unit of work, resolve to plan carefully, individualize instruction, improve control, give credit (where credit is due), and raise standards. The higher the student's or worker's achievement the more effective the teaching. Improve the individual and you improve your teaching.

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NEW director of vocational, industrial, and adult education for the Fort Wayne, Ind., schools is J. HENRY CHAPPELL who succeeds G. H. RUSSELL. . . . C. R. WRIGHT, former state supervisor of trade and industrial education for Illinois, has been appointed assistant superintendent in charge of vocational education for the Alton, Ill., schools. . . . GLADE WILCOX of Indiana State Teachers College, Terre Haute, has been named associate professor of industrial education at Texas A & M College, College Station. . . . JOHN M. HURLEY has been named acting director of industrial arts in the elementary and junior high schools of New York City. He was formerly supervisor of industrial arts. . . . R. RANDOLPH KARCH, prominent in printing education circles, has been appointed director of typography and research for the Ralph C. Coxhead Corp., Newark, N.J., manufacturers of the Vari-Typer and other composing machines.

Solving Gear Dimension Problems in Drafting

By John W. Titus

Compiled from reliable gear manufacturers' data, this outline of proportions for gear rims, arms, and hubs will save time for the machine drafting instructor. John W. Titus teaches related drafting in the Latrobe, Pa., High School.

OFTEN a drafting student is confronted with a gear problem for which he has no appreciation of the values of the various dimensions other than those formulas which are used for tooth design.

The table and diagram shown can be used to advantage as it supplies the essential information. The component dimensions are relatively easy to calculate and should suffice for the average design job performed in the school shop.

It is not practical, according to authorities, to give rules by which the parts could be proportioned to suit every case. However, it is convenient to have a rule of thumb that gives good results in many cases. Some designers make the rim depth, *B*, greater than the table shows and in small gears it is often made the depth of the tooth.

Machine designers in some industries go into this subject with considerable mathematical investigation for strength, but for ordinary-size gears it may be asked if the "flame is worth the candle," as one of the more important points to be considered is proportioning the arms to reduce internal strains through molding. When the gears are cast iron, the arms often crack from unequal expansion.

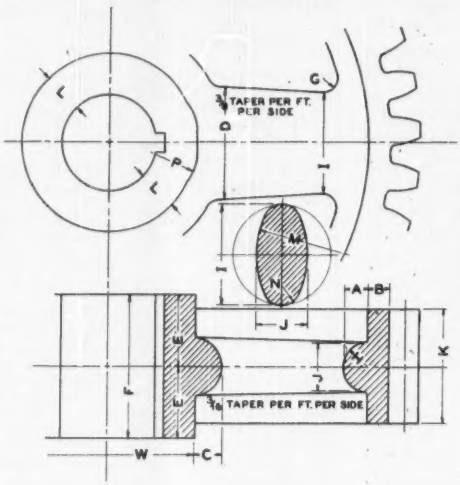
Several additional factors pertinent to spur-gear design might also be considered:

The limiting pitch diameter of a webbed gear wheel is approximately equal to $\frac{12.5\text{—D.P.}}{.5}$

Thickness of web=.6 C.P.

The number of arms in a gear wheel is approximately equal to $\frac{\text{P.D.}+60}{20}$

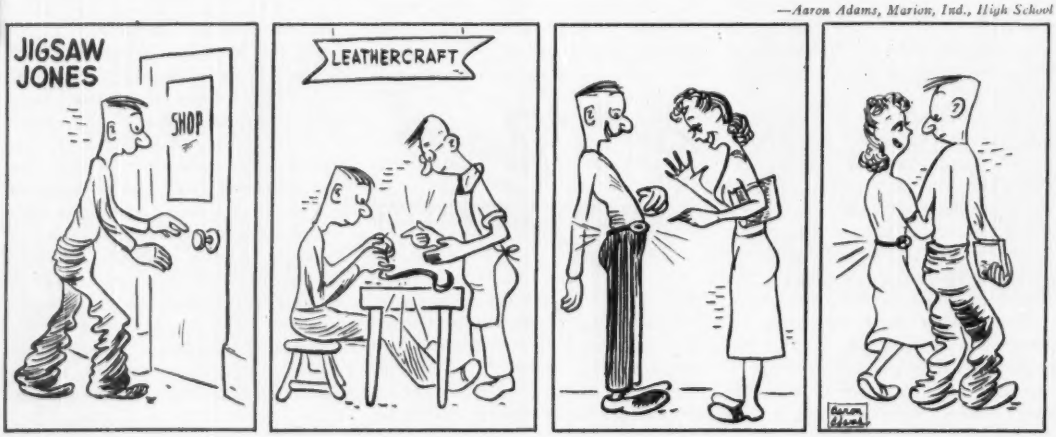
The limiting pitch diameter of a plain gear is approximately equal to $\frac{13\text{—D.P.}}{1.5}$



A = ½ OF J
B = .48 OF PITCH
C = ⅛ OF D, ABOUT
D = I + ⅜ PER FT. OF LENGTH
E = ½ K + 1/80 OF RAD. OF WHEEL
F = K + 1/80 OF DIA. OF WHEEL
G = ⅛ OF I
H = ½ OF J
I = 2⅛ X PITCH
J = ½ OF I
K = STD. GEAR FACES
L = 7/16 OF BORE
M = ⅜ OF I
N = ⅛ OF I
P = L + ⅛
W = 1⅜ X BORE

PROPORTIONS OF GEAR RIMS, ARMS AND HUBS

—Aaron Adams, Marion, Ind., High School



Let Students Help with Maintenance

By Fred C. Finsterbach

Here is a plan for making shop maintenance part of the total learning process. It includes a full program of student-performed maintenance operations. Fred C. Finsterbach, now associated with the Walker-Turner Division of Kearney & Trecker Corp., was Assistant Professor of Industrial Arts at Buffalo, N. Y., State Teachers College.

THE school shop, like all other units, deteriorates through use unless an effort is made to keep it at the peak of condition at all times. This conditioning or maintenance of the shop may be done at intervals, by the teacher, on a planned or a catch-as-catch-can basis. Further, it may be performed by personnel hired for the purpose or it may be considered part of the instructional procedure and the total learning situation. It is on the latter premise that this paper is based.

It seems that if learning situations are to be life-like and experiences made realistic, then maintenance, as well as *use* of a shop, might properly be a part of the student activity. This activity envisions more than the work-station clean-up and sweeping sometimes considered as maintenance. The full program encompasses repainting, repair, lubrication, new construction, planning of maintenance work, record keeping, installation, and custom work.

To set such a program in working order it is first necessary to establish willingness and accord among the students. This cannot be imposed but must come from within the group as a felt need. Any shop, at any time, shows evidence of wear and tear. A good approach is to indicate these sore spots by tags marked, "Out of Order"; "Marked for Repair"; "Unsafe for Operation," etc. This tends to focus student attention. A conference, skillfully conducted, then can elicit from the group a plan of action for student participation in the correction of the defects and for continued maintenance thereafter.

The teacher, however, must be prepared with a long list of potential maintenance jobs, which for convenience has been entered in a small notebook labelled *Maintenance Records*. If each of the job titles is numbered, it permits coordination with a maintenance order. (See Fig. 1.)

On the maintenance order is written the job description, more or less detailed, so that the order itself doubles as an instructional device. This order is numbered and dated to correspond with the job title in the record book.

Administration of Work Orders

Several ways for administering the work orders can be devised. One is to post the orders on a bulletin board and allow students to choose the job at a fixed or opportune time, between personal projects for example. So long as *each* student gets a fair share of the jobs, this way is satisfactory. Sometimes it is desirable to "knock off" personal work and assign the whole group to do some of the accumulated maintenance work. In this case it is helpful to the spirit to allow the students to "draw" the job from the pile of orders. This seems to have noticeable appeal at all ages and work particularly well for a general pick-up or "house-cleaning." A deck of cards, intended for repeated use, can be made up for such periodic tasks instead of the work orders. Sometimes, allowing *one* trade of cards, sight unseen, between students helps much to remove any possible reluctance.

While maintenance can be a continual process, and in some cases a student might prefer and can profit by continued maintenance, it is better to balance the maintenance time against personal work on a suitable ratio. Credit should be given for maintenance work just as for personal work. Sometimes attaching "time-and-a-half" to maintenance jobs or allowing them for "make-up time" adds considerable zest to the program.

Trust the Students

While the touch of the instructor is needed to supervise the whole program, the routine details can be delegated to the student personnel. In this case, the "maintenance foreman" is responsible for assignments and records of work accomplished. A form suitable for his use is shown in Fig. 2. It is generally advisable for the foreman to perform the job first so that his inspection standard is set by personal experience.

The essentials of the program are:

1. Set the stage psychologically and democratically.
2. Use a simple system of forms and records.
3. Appraise and evaluate maintenance work at least on a par with personal projects.
4. Use promotional devices from time to time to renew interest or to add zest.

Job classification under the following titles might be of general assistance in setting up the program: *Routine Clean-up Jobs*, daily, weekly; *Periodic Clean-up Jobs* (housecleaning), monthly; *Class Responsibility*, routine for one class; *Custom Work*, orders from other departments of the school (public-rela-

(*Continued on page* 31)

MAINTENANCE ORDER Fig. 1

COMPREHENSIVE GENERAL SHOP

ASSIGNED TO_____ CLASS_____ DATE STARTED_____

SUBJECT_____ ORDER NO._____

SIGNED_____ DATE COMPLETED_____

Class Responsibility

CHECK SHEET

TOPIC - Clean sink and washing facilities, towels, etc. DATE - 49-50

CLASS - 9[1] ROOM - 232 CHECKER - J. Finnigan

Code:
(.) Job assigned
(+) Job finished
Tue-Thur at 2:20

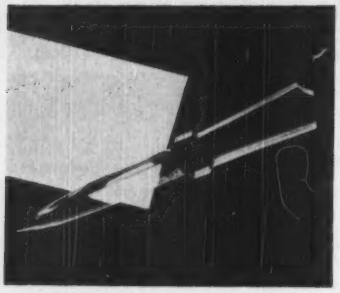
	NAMES	Feb. 1-3	Weeks											TOTAL
1	J. Finnigan	+												
2	T. Rhais	.												
3	B. Warren	+												
25	W. Walker	.												

REMARKS - Report to checker when job is finished. Job must be done to his satisfaction. Be sure you have done your best before reporting.

Fig. 2

Plastic Letter Opener

By Mervyn T. Jones



Hand operations were used exclusively in making this project, used to stimulate interest.

Here is a project for elementary work in plastics that will stimulate student interest. Mervyn T. Jones teaches at Stewart Junior High School, Norristown, Pa.

TESTED 55 PROJECT

AFTER making one of these openers for the sole purpose of creating interest in working with plastics, I was really amazed when so many boys expressed a desire to make them.

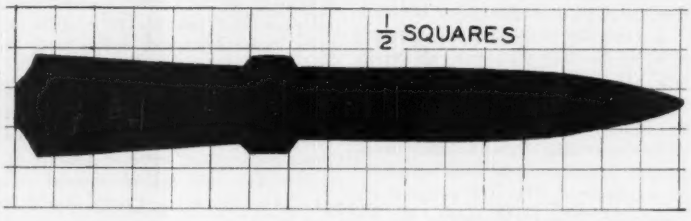
There are a number of reasons why clear plastics make a desirable and popular letter opener. Its transparent beauty, its light weight, and the clean looking appearance which it keeps are a few of the reasons.

Most junior-high-school students have use for the opener themselves or they have someone to whom they would like to give it. Many girls in our school were interested in having one and a number made them.

The one shown here was made entirely by hand. The pattern was first traced on the masking which covers the Plexiglas or Lucite. The tools found in an ordinary shop may be used to complete the project.

A fine-tooth coping saw or a jeweler's saw may be used to cut as close to the pattern lines as possible. Then, being careful to protect the plastic, it is clamped in a vise and carefully filed to shape with a smooth file. The entire filed surface is then rubbed with very fine emery cloth followed by very fine steel wool. For the final finish, fine pumice and water was rubbed on until the plastic took on its transparent beauty.

Naturally there are many better and faster methods of working this material but for those who are trying to get started in this work without a great outlay of money, this method should prove satisfactory.



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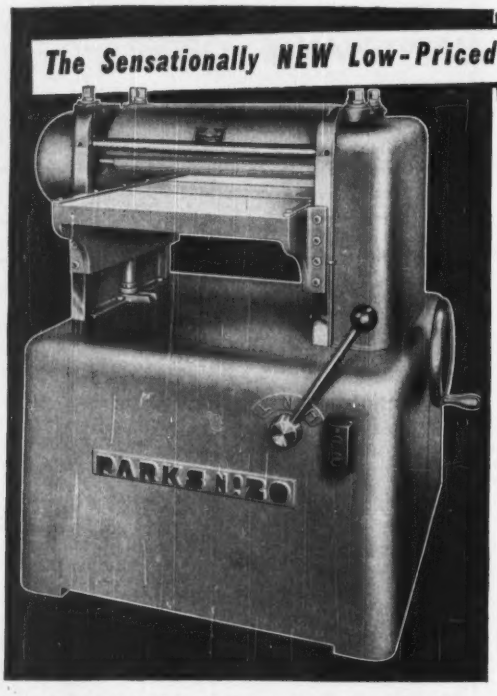

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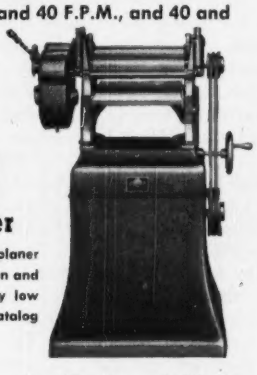

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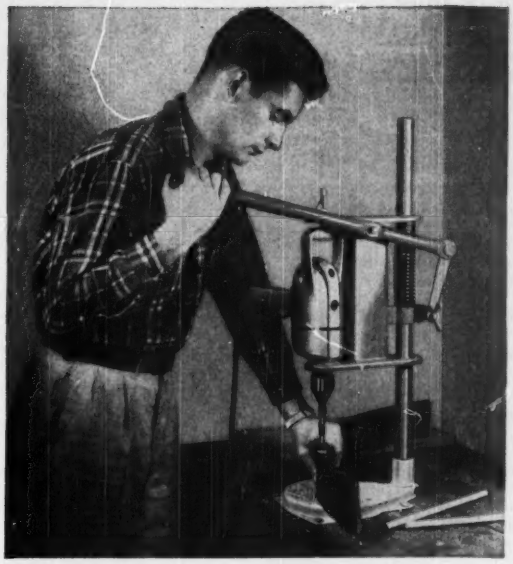

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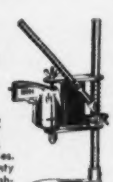

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IN THE Morning Mail . .

[Brief comments about SCHOOL SHOP and the field it serves are invited. Address the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

Gentlemen:

I want to extend my compliments to you on the April issue of SCHOOL SHOP . . . . I believe that the information which you have furnished will be most beneficial to a great many people throughout the country. The sources of your lists I believe are considerably more significant than had they come from the local level of schools. Using the state departments in various sections of the country was a wise decision on your part. Incidentally, I want to tell you how much I have enjoyed the little cartoons by Aaron Adams. I think they are effective teaching devices.

Kenneth W. Brown
Div. of Fine and Industrial Arts
Philadelphia, Pa., School District

Gentlemen:

The Dade County School System will provide a workshop program during the last three weeks in June . . . For the use of the industrial arts teachers as reference and instructional material we could use 35 copies of the April, 1950 issue to very great advantage . . . . .

Marshall Hurst
Coordinator for Industrial Arts
Dade County, Florida

Gentlemen:

You and your staff are to be highly commended for the comprehensive equipment and directory which is included in the April issue . . . Because my instructional program this semester includes "Course Development" I would like to obtain additional copies for class use . . .

Stuart Anderson
The Stout Institute
Menomonie, Wisconsin

[EDITOR'S NOTE: We will be pleased to comply with other requests for copies of the April issue. They may be purchased for 50c each. There are also a few copies of the April 1949 Planning issue which many teachers are using in combination with this year's April issue.]

Gentlemen:

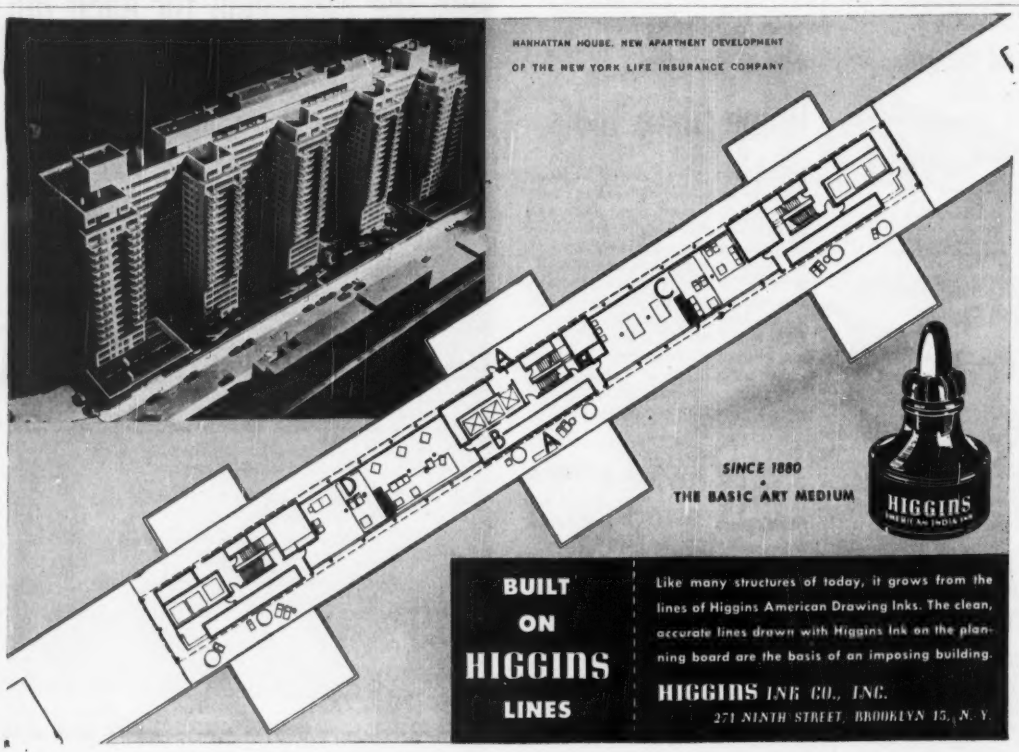
May an author correct his own mistake? The picture (submitted by me) of the drill press which accompanied my article, "Plan for Safety in Purchasing," in the April issue of SCHOOL SHOP was not good from the point of view of safety. Our good friend, Roy Van Duzee, has pinned my ears back. He objects, and rightly so, to the exposed belt and motor pulley. V-belts should be guarded without exception . . .

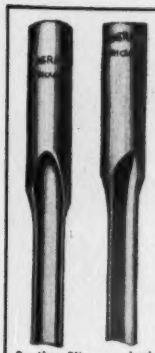
Wayne P. Hughes
National Safety Council
Chicago, Ill.

Gentlemen:

I received your latest edition of SCHOOL SHOP with emphasis on school shop equipment and planning. I feel that this is the most valuable number which has been published for a number of years . . . I am particularly interested in that section which indicates people responsible for the various programs in each state.

P. S. Waldeck
State Dept. of Education
Columbus, Ohio


MANHATTAN HOUSE, NEW APARTMENT DEVELOPMENT
OF THE NEW YORK LIFE INSURANCE COMPANY
SINCE 1880
THE BASIC ART MEDIUM
HIGGINS
BUILT ON HIGGINS LINES
Like many structures of today, it grows from the lines of Higgins American Drawing Inks. The clean, accurate lines drawn with Higgins Ink on the planning board are the basis of an imposing building.
HIGGINS INK CO., INC.
271 NINTH STREET, BROOKLYN 15, N. Y.



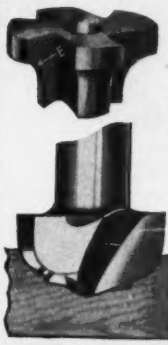
Routing Bits . . . single and double edge, straight flute and spiral.

two dependable sources for better cutters and better machines

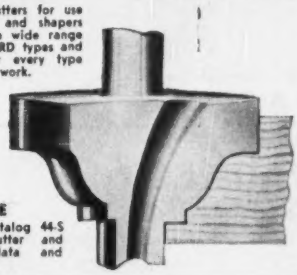
It costs no more to give your student bits and cutters used by industry. Bits and shaped cutters of standard design and built to order, of the finest tool steel and workmanship, for portable tool or machine use, are now available to vocational shops. Better tools produce better work.

1. for cutters

ONSRUD CUTTER MFG. COMPANY
800 E. BROADWAY LIBERTYVILLE, ILLINOIS



Shaping Cutters for use on routers and shapers available in wide range of STANDARD types and profiles for every type of shaping work.



WRITE
for Catalog 44-S for cutter and bit data and prices

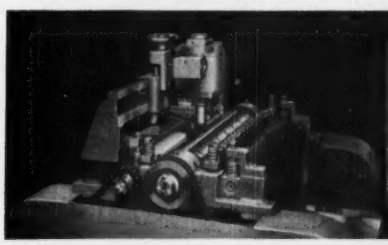
Onsrud W-180 combination Router-Shaper . . . Two spindle speeds . . . 10,000 RPM for shaping and 20,000 RPM for routing. Table raises and lowers by foot treadle control to bring work to and away from cutter.

Here is an ideal vocational shop machine. Teach the student the routing and shaping operations of cabinet work. Inlaying, carving, grooving, dove-tailing, veining, beading, fluting, joining, boring and many other woodworking techniques are possible and practical in this woodworking tool.

Write for Bulletin 1121 for complete details.

2. for woodworking machines

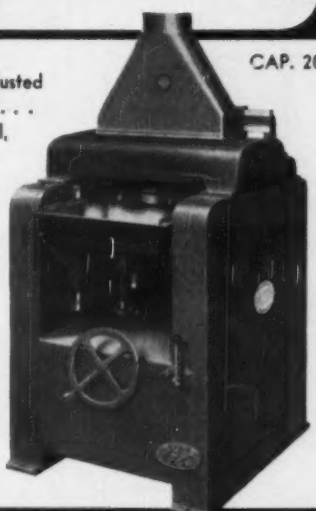
ONSRUD MACHINE WORKS INC.
3951 PALMER STREET, CHICAGO 47, ILLINOIS



THE *IMPROVED* BUSS NO. 208

unquestionably the best machine for teaching standard wood planing practice

CAP. 20 x 8

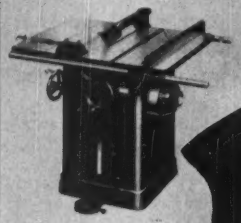


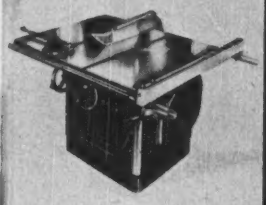
Judge for yourself. It is the only planer in the low-cost field that is adjusted and operated similarly to the large standard machines used in industry . . . the only planer in this class that is equipped with a sectional infeed roll, sectional chipbreaker and four driven rolls — permitting the planing of pieces of varying thickness without the danger of kick-back. It's also the only small planer with in-built knife grinder and other big planer features. The grinder permits the instructor to grind the knives and joint them in just a few minutes. This saves much of his time and tends to eliminate the dull knife condition which so frequently prevents the student from doing good work. The frame is now a heavy one-piece semi-steel casting for great rigidity and strength. All driving mechanism and electrical wiring is fully enclosed, engineered for maximum safety. Judged from any angle the No. 208 is the best possible selection for the school shop and the price is well within the means of the average school budget. Write for the complete facts.

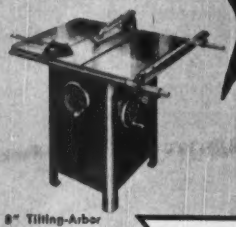
BUSS
MACHINE WORKS
246 EIGHTH ST., HOLLAND, MICHIGAN

DELTA's
complete quality line has

Saw Jointer Combination
2 models


10" Tilting-Arbor Saw
2 varieties


12" Tilting-Arbor Saw
6 varieties


8" Tilting-Arbor Saw
2 varieties

Delta Multiplex
40A

Tool Grinder
with Twin-Lite® Safety Shields
18 varieties

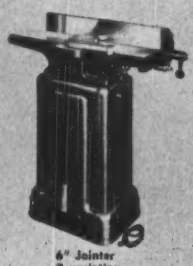
DELTA
MILWAUKEE
®

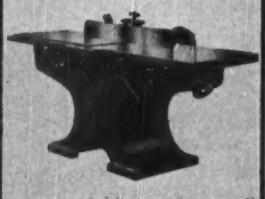
Belt Sander
2 varieties

Disk Sander
3 models
4 varieties

Mortiser

Wood Lathe
2 varieties


6" Jointer
2 varieties


8"-12" Jointer

24" Scroll Saw
2 varieties

Combination Spot
and Arc Welder
2 varieties

Toolmaker®
Surface Grinder

20" Band Saw
3 varieties

36" Band Saw
3 varieties

14" Band Saw
4 varieties

- **Delta-Milwaukee® Machine Tools**
- **Delta® Multiplex Radial Arm Saws**
- **Crescent Woodworking Machines**

the right machines for your program and budget

P-24 Planer

14" Drill Press
2 models — 20 varieties

17" Drill Press
2 models — 16 varieties

Cabinet Shaper

53 machines!...246 varieties!

The Delta line has the machines you need. It's the most complete line available — the only line with complete accessories to make every machine more useful.

What's more, Delta machines are ideal for the school shop, too: They are safe and easy to operate. They are economical to buy and operate. They are compact, occupy little floor space. Their height is convenient for students.

Industry wants people trained on Delta machines. For they are machines that are used by practically every branch of American industry.

Investigate further the advantages of the metalworking and woodworking machines in the broad Delta line. See them now at your nearby Delta distributor.

Send coupon below for facts on every machine in the entire Delta line — and for a free copy of "How to Plan a School Workshop."

Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.

Sold only through authorized dealers.
Available on deferred payments to fit your budget.

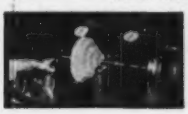
These typical quality features insure long life, continued accuracy, and low maintenance costs!

Lubricated-for-life Ball Bearings. Never need oiling—they're lubricated for life before they leave the factory. Double-sealing keeps dirt out, lubricant in.

Precision-bored Bearing Seats. Perfectly round, true to size, correctly positioned, properly aligned. Bearings fit closely, are tightly held, cannot become loose.

Pre-loaded Bearings. An extra manufacturing operation removes "end play." This provides maximum rigidity and accuracy under load and increases bearing life.

Precision-ground Shafts. All spindles, arbors, and collars are ground for accuracy, to provide full, even contact between shaft and bearing, assure accuracy.



Dynamically-balanced Pulleys. All pulleys which rotate at high speed are dynamically balanced to help eliminate damaging vibration.

POWER TOOL DIVISION
Rockwell
Manufacturing Company
MILWAUKEE 1, WISCONSIN

Tear out coupon and mail today!

Power Tool Division
ROCKWELL MANUFACTURING CO.
712F E. Vienna Ave., Milwaukee 1, Wis.

Send me free catalog and bulletins on the complete Delta quality line—also booklet, "How to Plan a School Workshop."

Name.....

Position.....

School.....

Address.....

City.....( ) State.....

6-49

School Shop KINKS

Payment will be made for each Kink published. Send to Editor, School Shop, Ann Arbor, Mich.

Roll 'Em

Every good instructor in industrial arts and vocational education realizes the advantages of using full-size working drawings. This desirable situation is not always achieved due to the problems confronted in securing drawings which will endure under the excessive wear usually prevalent in school shops.

An answer to this problem is supplied in the use of discarded window shades on which full-size working drawings can be drawn with ease. Sources for such shades may be found within your own school, especially if older shades have been replaced with some newer types.

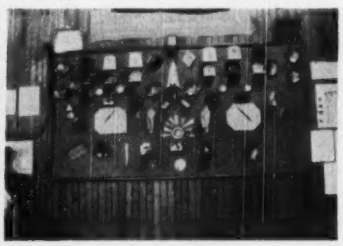
Light-colored shades are preferable so that regular drawing pencils may be used on them. Once the drawings are complete it is wise to coat them with a fixative material, such as used on charcoal or pencil renderings in art or drawing classes. This will "fix" the pencil lines on the surface of the shades, preventing smudges.

Some of the advantages of such a medium for full-size working drawings are: (1) durability; (2) ease with which drawing pencils apply themselves on the surface; (3) compactness for easy indexing and storing; (4) ease of mounting on standard shade brackets when in use; (5) prevention of excessive wear and soiling; and (6) ease of rolling up shade when drawing is not is use.

As employed in the school shop, it has been found that window shades used for making full-size drawings have proven to be more durable than blueprints, blackboard drawings, plywood, or heavy paper mediums. It is far more convenient and costs less.—*Alvin R. Lappin, Salinas Union High School, Salinas, Calif.*

Flexible Bulletin Board

Bulletin boards can be used for many other purposes than just providing a place to stick miscellaneous sheets of paper. Illustrated is one such use. The once-a-year exhibit of student work is all



right, but here is a way to secure continuing motivation. Students whose work is displayed on the bulletin board get the feeling that the effort was worthwhile. Those who aren't represented make plans to rectify that little oversight by doing better on the next project. In addition, such a use for the bulletin board helps dress up the shop or corridor.—*E. LeRoy Longley, Baltimore, Md., Polytechnic Institute.*

Slotting Tip

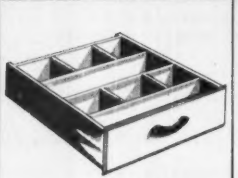
That screw head with the shallow or narrow slot that must be made to fit a reasonably thick screwdriver can be recut with a hacksaw. Put two blades in the hacksaw frame at once and you can cut a very ample slot.—*Paul C. Hoopes, Abraham Clark High School, Roselle, N. J.*

SHARE your teaching secrets with others. Send in *Kinks* for use in this section.

COMPLETE OR PARTIAL INSTALLATION BACKED BY YEARS OF "KNOW-HOW"

Whether your requirement is a few additional pieces of furniture or fully equipped new departments . . . laboratories, homemaking, art, vocational or industrial shops . . . Sheldon provides standard and modified units that are outstanding for excellence of design and construction . . . qualities that long and hard usage only serve to emphasize. In experience and facilities, Sheldon is unsurpassed; and Sheldon's record of customer satisfaction is unique.

Look TO SHELDON
For LEADERSHIP!



IT'S THE DETAILS THAT MAKE THE DIFFERENCE

Whether of wood or metal, Sheldon furniture is soundly engineered and carefully constructed. Drawers and doors continue to function properly despite hard usage. Drawers are equipped to receive partitions that are easily arranged and rearranged to accommodate contents for orderly storage and to prevent breakage . . . Just one more example of Sheldon's thoroughness in detail.

The key to your complete equipment problem

E. H. Sheldon & COMPANY
MUSKEGON, MICHIGAN

SCHOOL SHOPPING

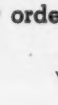
SCHOOL SHOPPING

SCHOOL SHOP's September, 1950, issue will institute a new feature—regular classified advertising, under the general heading of "SCHOOL SHOPPING." Advertising covering such items of general interest to shop teachers and supervisors as the sale of used machinery, teaching jobs available, teaching jobs wanted, shop instructional material available, etc., will be accepted at the following per-line rates: (Each line to be 43 characters, including punctuation and spaces)

1 insertion	*5 insertions*	*10 insertions*
$1.75 per line	**$1.65 per line**	**$1.50 per line**

Cash must accompany order. SCHOOL SHOP will provide a box address for any one desiring it. Send your order NOW to SCHOOL SHOP, 330 S. State St., Ann Arbor, Michigan, on the handy order form provided below.

Whatever your service or equipment, if it is of interest to people engaged in industrial education, you can reach them all only through SCHOOL SHOP—the ONE publication in its field received by 24,000 shop teachers, principals, and supervisors. Reach them ALL with SCHOOL SHOP—use the handy order form below.



If you have used material to sell or trade, use an ad like this

EXAMPLE

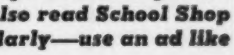
For sale, 10" planer, 3 years old, good condition. Includes motor. Price $000, plus shipping charges. Dept. Voc. Education, Blank School, Blank, Bk.

If you are looking for a new shop teacher (most of them read School Shop regularly), use an ad like this

EXAMPLE

Teaching position available Sept. 10 in midwestern city for general shop teacher. Write giving full particulars to Box 00, SCHOOL SHOP, Ann Arbor, Mich.

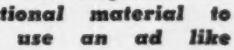
If you want a new Shop-Teaching opportunity — principals and supervisors also read School Shop regularly—use an ad like this



EXAMPLE

Would like shop teaching position in blank area. 10 years experience; includes wood, metal, crafts. Starting salary expected $0000. Will gladly furnish full record on request to Box 0, SCHOOL SHOP, 330 S. State St., Ann Arbor, Mich.

If you have shop-tested instructional material to sell, use an ad like this



EXAMPLE

Project plans for leather, wood, plastics classes available from John Doe. All material has been shop-tested. For complete catalog, write: John Doe, 000 Grand Ave., Blank, Bk.

School Shop

330 S. State St., Ann Arbor, Michigan

Gentlemen: Please place the following ad in your classified SCHOOL SHOPPING section, at the following rates: 1-insertion, $1.75 per line; 5 insertions, $1.65 per line; 10 insertions, $1.50 per line. Each line 43 characters, including punctuation and spaces. The ad is to appear in the following issues:

I enclose $..... (Minimum charge—$5; cash must accompany order.)

Here is my copy:

If you do not want own name and address used, CHECK HERE ☐ and SCHOOL SHOP will provide box address. Publisher reserves the right to reject any advertisement.

News

HAPPENINGS IN INDUSTRIAL EDUCATION

Industrial Arts Teachers

MEMBERS of the American Industrial Arts Association who are engaged in teacher education held a separate meeting in connection with the annual AIAA convention in Cincinnati last month. The AIAA teacher-trainers convened on the 10th, one day before the convention began. The chief topic was the formation of a council for teacher education to study the problems in that area of the industrial-arts profession.

Smith Honored

THE RETIRING professor of industrial arts at the Ohio State University, Robert E. Smith, was honored at a banquet in Columbus, home of the university, on May 20. Professor Smith, who retires at the end of this semester, has been named visiting professor at Southern Illinois University, Carbondale, for the summer session. His successor at Ohio State will be Joseph R. Stroebel, Ohio State Director of Vocational Education.

Cooperation

AN example of extraordinary cooperation with industrial education is that given by the Rock Island, Ill., Superintendent of Schools, Earl Hanson. When more students than there was capacity for enrolled in vocational-education classes in neighboring East Moline, Mr. Hanson made a machine shop in the Rock Island district available. So now students and an instructor from East Moline travel back and forth by bus from their school to one in Rock Island for their class in machine shop.

Welding Information

THE department of welding engineering at Ohio State University, Columbus, has completed a new patent classification index on more than 12,000 United States patents in the field of welding. The index will be housed in Ohio State's A. F. Davis Welding Library. Use of the index is without charge to visitors; a small charge to defray clerical expense will be made on inquiries by mail.

For Valor

TWO students at the Dunbar Trade and Vocational School, Chicago, Ill., have been honored for their courage in rescuing two small children in a recent fire in Chicago. The students, Gerald Best and Joseph Wyatt, received the award from a Chicago newspaper as civilian heroes of the month of March.

Looking Ahead

MASSACHUSETTS is the state in which the New England Industrial Arts Teachers Association will meet next November 3 and 4. The city to be honored had not yet been selected as we went to press.

Summer Sessions

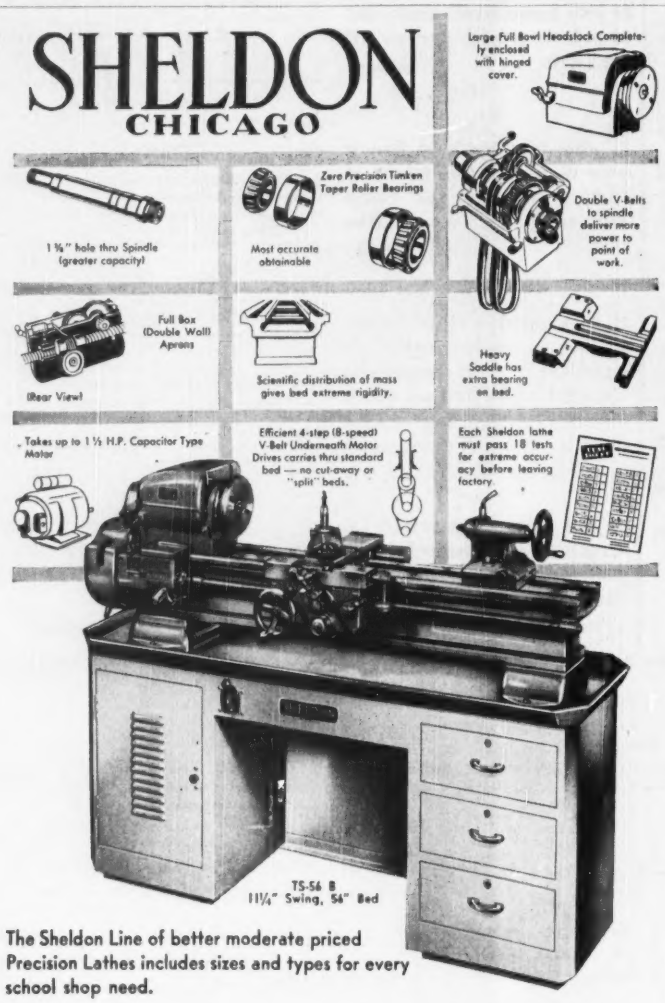
PLANS are in order for many 1950 summer sessions for industrial educators in colleges and universities throughout the country. Three announcements which have been received here are:

1. A two-weeks industrial-arts summer workshop sponsored by the Illinois State Board for Vocational Education to be offered simultaneously at Bradley University, Peoria, and at Eastern Illinois State College, Charleston, August 14 to 25.

2. A series of three intensive, one-week courses in electroplating offered by the Joseph B. Kushner Electroplating School, Stroudsburg, Pa. The courses will cover respectively modern electroplating principles, gold-plating technics and problems, and recent developments in electroplating, the weeks of August 6, 13, and 20.

3. An intensive, four-week course in silversmithing sponsored by the Handy and Harman Co., New York, N. Y., at the School for American Craftsmen, Rochester, N. Y., July 31 to August 25.

SHELDON
CHICAGO


Large Full Bowl Headstock Completely enclosed with hinged cover.
Zero Precision Timken Taper Roller Bearings
Most accurate obtainable
1 ⅛" hole thru Spindle (greater capacity)
Double V-Belts to spindle deliver more power to point of work.
Full Box (Double Wall) Aprons
(Rear View)
Scientific distribution of mass gives bed extreme rigidity.
Heavy Saddle has extra bearing on bed.
Takes up to 1 ½ H.P. Capacitor Type Motor
Efficient 4-step (8-speed) V-Belt Underneath Motor Drives carries thru standard bed — no cut-away or "split" beds.
Each Sheldon lathe must pass 18 tests for extreme accuracy before leaving factory.
TS-56 B
11¼" Swing, 54" Bed

The Sheldon Line of better moderate priced Precision Lathes includes sizes and types for every school shop need.

Write for Catalog. State size of lathe and floor space requirements.

SHELDON MACHINE CO., Inc., 4260 N. Knox Ave., Chicago 41

In TODAY'S *Graphic Arts Instruction*

OFFSET'S A MUST!

Offset is already as essential a part of modern printing as letterpress, and is growing rapidly in importance. Practically any shop the student eventually enters will have an offset department, usually equipped with one or more ATF Chief offset presses. For the same reasons that printers choose ATF Chiefs for high quality, fast and profitable production, these presses offer numerous advantages for student instruction. Their design and construction are easy to understand, their complete facilities and simple adjustments for the finest offset work are readily mastered by the students. What they learn on a Chief will give them complete command of any other sheet-fed offset press.

Write for detailed information on the ATF Chiefs and other ATF equipment for graphic arts instruction, as well as for complete cooperation in laying out and planning the department.

Other ATF Equipment Available for School Shops

ATF Kelly Presses
ATF Little Giant Automatic Jobber
ATF Process Cameras
Offset Platemaking Equipment
Lens-O-Matic Diaphragm Control
ATF-Macbeth pH Meter
Composing Room Cabinets
Vandercook Proof Presses
The greatest variety of foundry type in the world and every item needed for composition, presswork and bindery

American Type Founders

Department of Education 200 Elmora Avenue, Elizabeth 8, New Jersey

Teaching Tools

POINTERS ON INSTRUCTION and SHOP ADMINISTRATION

By John F. Nowak

Time to Close Up

LOOKED at in September, the time between the opening and closing of school seems to be long. Looked at in June, one wonders where all the time has gone. There is so much to be done in closing shop and seemingly so little time in which to do it.

Ask a dozen teachers this question. "How do you prepare for closing?" and you will receive a dozen different answers. Some teachers of academic subjects might reply, "It's a cinch! I finish all required records, clean out and lock my desk and closets, get my hat and I'm ready to go!" If only it were that simple for the shop teacher.

There is no prescription, apparently, which will answer the closing-out problems in every type of school shop. There are, on the other hand, many closing-out chores which are common to all shops. Here are a few suggestions:

1. Do not wait until the last or even the next-to-last day of school. Begin to do some thinking about the problem now. Determine as nearly as you can what has to be done to properly put your shop in shape for closing. At the same time determine the order in which these chores should be performed. Next, approximate the time it will take to perform each chore. For example, it is probable that you can place the shop library in a storage chest several days before the year-end. This should work no hardship on instructors or students. On the other hand, you should not schedule a permanent closing of the tool crib until the last day of school.

2. Once a check list of all anticipated closing-out chores has been made, go over it carefully and determine which chores must be done by the teacher personally and which may be entrusted to a few selected students.

During the summer the custodial staff normally does the wall washing, patching and painting, floor scrubbing and refinishing, etc., that must be done in rooms and shops. Your shop should be left in such condition as to assist rather than impede these and similar maintenance operations.

You can utilize student assistants to take down and store illustrative materials, such as models and mock-ups, charts, etc. The aim here is as much protection as storage, so be certain that the students work under teacher supervision. You want to find the materials in ready-to-use condition when you open up in the fall. Do not pile these valuable aids to teaching on tops of standing closets and consider the storage problem solved.

3. Careful attention should be given to rust protection for machines which will be idle for a period of weeks. The common practice is to use a neutral-base grease (any light, easily-dissolved protective coating) for this purpose.

4. Some school systems take advantage of the summer vacation to have machines repaired, calling in outside contractors for the work. Shop teachers who have machines earmarked for repairs should leave all detachable parts in containers and should make out inventories in triplicate (one each for the school administrator, the contractor, and the teacher's file). In addition, where the trouble in the machine is not visible, the teacher should leave a memo indicating his observations of the faulty operation for the guidance of the contractor.

5. Summer activities are, of course, offered in some schools. Teachers should find out if their shops are to be used in such programs. If they are to be in use, the teacher should leave machinery in operable condition.

6. A final word which is probably superfluous judging by the shop teachers we know, enjoy your vacation! *J.F.N.*

BOICE-CRANE SIX-INCH JOINTER

Tables are 5" longer than most others, for the accurate jointing of 25% to 50% longer stock, and the fence is 33" long (10" longer than most others). The ONLY fence that is 100% rigid. The only 6-inch jointer with quick acting fence locks at BOTH ends. The 2¼" diameter cutterhead has a 3" diameter cutting arc, the largest in any low-priced 6-inch jointer, for freer cutting "rake-angle" to knives, for a chatterless and much smoother shearing cut rather than the chipping and chattering cut common to smaller diameter cutterheads. Cutterhead and bearings will withstand speeds up to 5500 r.p.m. Dual fence controls BOTH at operator's fingertips. Floor cabinet has motor compartment and dust chute. Four models, belt or direct motor drive, bench or floor type. Overall length: 43½". Tables: 6" wide x 36" long. Fence: 33" long x 3⅝" high. Max. width of cut: 6". Depth of cut, max.: 9/16". Cutterhead: 2¾" dia. 3 knives.

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Now—a full line of moderately priced Shaper Cutters and Cutter Sets for commercial grade *Cabinet Work, Millwork, Window Sash, Storm Sash and Doors.* The Boice-Crane TRU-FORM principle of cutter making assures numerous advantages over ordinary knives and cutters.

TRU-FORMS are two-wing milled-to-pattern cutters improved by CIRCULAR or INVOLUTE relief. But in TRU-FORMS Boice-Crane has found a way to give you all the advantages of involute relief without the customary premium price! Now at moderate prices you can get cutters that:

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2. Cut the true, original shape and dimensions as long as the cutter lasts.
3. Provide a larger rake angle. Never a laggy, scraping cut. Always easy, clean cuts that shear or shave the work without vibration.
4. Up to 50% more usable cutter life.
5. Provide improved clearance so necessary for successful high speed shaping.
6. Reduce cutting edge crumbling or breaking down—common with straight relief cutters. Tru-Form tooth shape reinforces cutting edge and dissipates more heat.

Fine tungsten tool steel. Deep uniform hardening. Precision formed. Razor sharp.

Designed for Boice-Crane shapers, but improve performance of all other makes.

BOICE-CRANE INTERMEDIATE CAPACITY POWER TOOLS

- Designed for ready adaptability to a wide range of projects, fewer machines are needed to fill all your requirements.
- As nearly 100% safe as modern devices permit.
- Just the right size for school shops—not too big, nor too small. Permit more efficient shop layouts.
- Durably constructed, they can take a beating which would incapacitate most machines.

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Please send free literature on Boice-Crane's ( ) Jointer; ( ) New 44-page catalog No. 50 on entire line; ( ) Bulletin on Tru-Form Cutters for Shapers.

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A complete line of hacksaw blades for cutting metals by hand or machine. Now packed 100 hand blades in a box, 10 power blades in a box. Easy to order, impossible to beat.

BAND SAWS

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New Starrett Hacksaw and Band Saw Catalog "28" describes the entire line, gives complete information on cutting any material by hacksaw or band saw. Free on request.

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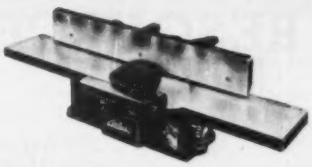
Atlas 6" JOINTER
FOR SCHOOL SHOPS



Here is today's outstanding jointer-planer for school shops! It's big, fast, accurate . . . ruggedly built to industrial standards. Gives you commercial size capacity plus features never before found in a 6" jointer—*at a price within school budgets.* Makes good workmanship easier, simplifies instruction, steps up student interest.

42" precision-ground grey-iron table. 32" two-way tilting fence. Deep-grooved precision ball bearings. Stationary rear table. And with exclusive *simultaneous blade positioning,* blades can be resharpened *without disturbing their setting.* Send a postcard today for catalog with full details.

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- Planes Stock up to 6" wide
- Rabbets up to ½" deep

This sturdy, compact 6-inch Jointer is a favorite in school shops. Handles all classes of small work. Rigid one-piece frame carries tables, cutterhead, motor, fence, guard. Tables easily adjusted and locked in position. Fence adjustable across tables, and can be tilted and locked to 45°. Ball bearing cutterhead fitted with finest thin steel knives. *Write for Bulletin 133.*

"Oliver" makes a full line of larger Jointers in sizes from 8-in. to 30-in.

OLIVER MACHINERY COMPANY, GRAND RAPIDS 2, MICH.

"YANKEE"
Spiral Drivers & Push Drills
TEACH MOTION-SAVING

Help students do better work with fewer motions. Just a simple push with a "Yankee" Spiral Screw Driver spins the blade and drives the screw. No heavy wrist work! A flick of the shifter gives driving or drawing action, or sets spiral rigid. Pilot holes made easily with a "Yankee" Automatic Push Drill. Spring brings back handle after every push; reverse-spins drill point to clear out chips. Magazine handle holds 8 points, 1/16" to 11/64". Write for free "Yankee" Tool Book.

No. 130A Spiral Driver

No. 41 Push Drill

NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

Instructional RESOURCES

Books:

Practical Photography. Robert A. McCoy. Bloomington, Ill.: McKnight and McKnight Publishing Co., Inc., 1950. Pp. xv + 221. $4.00.

Here is a text that may be profitably used by high-school classes, beginning college classes, and interested amateurs not in school. The treatment is such that readers may dip into the book for information on specifics or begin with the first chapter (The Story of Photography) and pursue the subject to the end chapter (Professional Photography). There are many good examples of photographic work but a few more pictures illustrating technics would have been helpful.

Robert A. McCoy is Assistant Professor of Industrial Arts, Santa Barbara College of the University of California.

Woodwork Visualized. Ross C. Cramlet. Milwaukee, Wis.: Bruce Publishing Co., 1950. Pp. 158. $2.50.

The proportion of illustration to text is quite high in this book. The effect is to provide a guidebook to woodworking technics that actually *visualizes*. There are many step-by-step drawings, close-ups of tools and devices, and easy-to-read plans for project material.

Ross C. Cramlet is Supervisor of Technical and Industrial Training, Des Moines, Iowa, Technical School.

Problems in Mechanical Drawing (First Course). A. S. Levens and A. E. Edstrom. New York: McGraw-Hill Book Co., 1950. Pp. vii + 50 plates. $1.48.

An interesting tie-in to the French and Svensen text, *Mechanical Drawing*, and McGraw-Hill Textfilms on drawing, this volume is intended for use in a two-semester beginning drawing course.

A. S. Levens is Professor of Engineering Design at the University of California and A. E. Edstrom is Instructor at the City College of San Francisco, Calif.

Radio Operator's License Q & A Manual. Milton Kaufman. New York: John F. Rider, Publisher, Inc.: 1949. Pp. ix + 608. $6.00.

Questions from past exams for use in preparing for Federal Communications Commission licensing tests are included in this work, along with illustrations which serve to make the answers clearer to the student. There is new material in the appendices which teachers, operators, and students can use to bring themselves up-to-date in the field.

Milton Kaufman is an instructor in the Department of Radio Operating, RCA Institute, New York City.

Automobile Body Rebuilding and Refinishing. William K. Toboldt. Scranton, Pa.: International Textbook Co., 1950. Pp. vii + 464. $4.00.

For better or for worse, the modern automobile is a great deal more complex than was the one of a decade or so ago. It is now a major operation to fix a fender, for example, which is a part of the body in today's car. This is a valuable book about use of up-to-date tools and appliances in auto-body repair and rebuilding. It is profusely illustrated with pictures and diagrams.

William K. Toboldt is the editor of *Motor Service Magazine*.

Television Tube Location Guide. Howard W. Sams (compilator). Indianapolis, Ind.: Howard W. Sams and Co., Inc., 1950. 215 plates. $1.50.

This book of charts on receiver tube complement layouts will be increasingly of use as more television sets are manufactured and sold and as more technicians are needed and trained. It is another in the Sams' Photofact publications.

Direct Current Motor Manual. H. S. Dusenbery. New York: The Macmillan Co., 1950. Pp. x + 274. $3.50.

This is a reference for the trouble-shooter and the man who may have to be one. It details motor structure and trouble spots and gives instruction on how to correct them. There is an appendix of useful information and a glossary of terms common to the field of electric motors.

H. S. Dusenbery is an engineer in the Electrical Department of the Moore Dry Dock Co. and a former instructor in electrical engineering at Santa Clara, Calif., University.

The Joy of Hand Weaving. Osma C. Gallinger. Scranton, Pa.: International Textbook Co., 1950. Pp. xxi + 306. $4.25.

This is an interesting book for the person who is looking into weaving as a craft and hobby. It also supplies valuable background material for a study of this phase of the textile industry. The first part is concerned with simple or plain weaving. Part two offers information on the more intricate pattern weaving.

Osma C. Gallinger is a partner (with her husband) in a weaving industry in Guernsey, Pa.

General Electricity. E. W Jones. Bloomington, Ill.: McKnight and McKnight Publishing Co., 1950. Pp. 90. $1.00.

The Preface to this paper-covered book states rightly enough that general courses in electricity should be simple, direct, and broad enough to help young people "to do better those electrical things they will always be trying to do anyway . . ." The progress is from the simple (magnets and magnetism) to the more complex (radio, circuit defects, soldering) and the last unit is a series of shop projects.

E. W. Jones is Associate Professor of Physical Science, Pittsburg, Kas., State Teachers College.

Pamphlets:

Automobile Mechanics for Vocational High Schools is a syllabus in booklet form prepared by the Vocational High School Curriculum Planning Committee of the Board of Education of the City of New York. It relates the auto-mechanics course for metropolitan vocational schools to the broad program of education for life as it is followed by the New York City system.

Chapters are devoted to occupational information, course of instruction, shop management, safety instruction, and methods of instruction. There is an appendix which lists such aids as films and filmstrips, books, and manufacturers, and gives representative shop layouts and illustrations of equipment.

Vocational Education for American Youth is a booklet of the American Vocational Association. It reflects the present-day view that "in the usually-accepted sense, vocational education on the secondary level includes any and all knowledge and training that will contribute to a satisfying and useful life of employment." It describes the role of vocational education in our society, points out some goals, and presents some problems which are now being faced by vocational educators.

For information about this and other AVA publications write to American Vocational Association, 1010 Vermont Ave., N.W., Washington 5, D. C.

Industrial Arts Syllabus in Comprehensive General Shop (1949 revision) is a bulletin of the University of the State of New York which outlines the industrial-arts work for grades 6, 7, and 8. Its aim is toward flexibility in order that programs may be developed which are suited to conditions in industrial-arts shops in cities and villages alike. An introductory section outlines industrial arts and its place in the educational scheme. Section two is broadly about content and it takes up project material, operations and processes, and demonstrations and related lessons. The third section is devoted to records and reporting. The final section is given over to outside preparation.

Although this pamphlet is not available for general distribution, there are a few copies which will be sold at 20c each. Write to the Bureau of Industrial Arts Education, the University of the State of New York, Albany 7, N. Y.

Audio-Visuals:

The Human Bridge is a film which tells the story of the production of the new Ford automobile. The narrative covers the span (around two years) between drawing board and assembly line on a modern car. Such shots are included as those taken during test runs in the desert.

Arrangement for showing film may be made through the Community Relations Dept., Ford Motor Co., Dearborn, Mich.

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Revolutionary Method of "Suede-Tex" Flock Finishing in Any Color Desired Opens New Beauties to Craft and Shop Projects. Decorate, Cover Repairs, Apply Scratchless Bases to Wood, Metal, Plastic, Glass, Plaster, Paper, Cardboard, etc.

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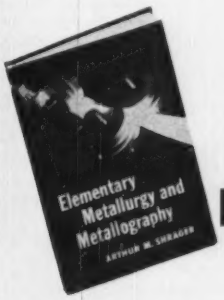
Two outstanding texts for vocational courses

MOTOR TUNE-UP MANUAL

By Ralph J. Everest

Exceptionally full, clear explanations of auto electricity and of engine and combustion principles give the student the knowledge he needs in order to make the right analysis of engine trouble as well as to make corrective adjustments accurately and skillfully. All engine parts are clearly explained. Detailed instructions are given for every step in both minor and major tune-up jobs. "A very fine text," says the Dir. of Vocational Education in Lockport, N. Y. "Very clearly written and well illustrated." $5.50



ELEMENTARY METALLURGY AND METALLOGRAPHY

By Arthur M. Shrager

The first text on this important basic science for vocational school students, already being highly recommended by the metals trade because "it affords ample opportunity to gain a useful working knowledge and understanding of the subject . . . clear, concise, and easy to follow." (Stuart Kingsley, in *Journal of the Franklin Institute*). This book now supplies the teaching materials you need for the related science course on metals for students of foundry, welding, and the other metal-working subjects." $4.75

Write to our Educational Department for sample copies to consider for your courses next term.

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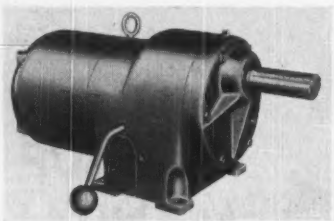
News from INDUSTRY

Lima Gearshift Drives

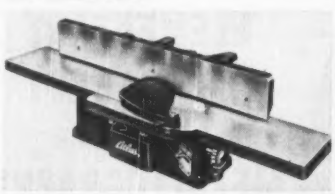


The Lima Electric Motor Co. announces the addition of a new unit to its line of Lima gearshift drives. Designated as the Type R3C, it features a combination integrally-mounted electric motor and a four-speed transmission having both primary and secondary gear ratios. This unit fills the need for a compact drive of modern design providing low, multiple output speeds.

Lima gearshift drives are designed for operation on polyphase, a-c, power supplies of standard frequencies and voltages below 600.

For additional literature and information, write Mr. Richard R. Knierim, Sales Manager, The Lima Electric Motor Co., Dept. AD-10, Lima, Ohio, mentioning SCHOOL SHOP; *or check no. 55 on the coupon.*

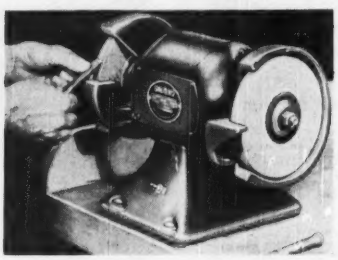
The Atlas 6000



The new Atlas 6" jointer-planer has many outstanding features. It features greater accuracy, safety, economy, production, and efficiency. One highlight is the easily-removed rear bearing cap. When the head is removed for resharpening there is no disturbance of the setting. Blades position automatically when the head is replaced.

For further information on the new Atlas 6000, write the Atlas Press Co., 26031 N. Pitcher St., Kalamazoo, Mich., mentioning SCHOOL SHOP; *or check no. 56 on the coupon.*

SKILSAW Bench Grinders



A new and complete line of bench grinders, featuring extra-large work clearance, has just been announced by SKILSAW, Inc., makers of SKIL Tools.

Designed to permit easy handling of large and bulky pieces, the new bench grinders allow more accessibility to grinding wheels. Workers now have wider range to swing large, long, and odd-shaped objects. SKIL ¼ hp and ⅓ hp grinders are "flat-faced" to provide full clearance for difficult jobs. SKIL ½ hp and 1 hp grinders have compact motors which also give the workers more room for grinding bulky objects.

For full details and specifications, write to SKILSAW, Inc., 5033 Elston Ave., Chicago 30, Ill., mentioning SCHOOL SHOP; *or check no. 57 on the coupon.*

Vibra-Phragm

A new type of sound generating device that is used as a radio telegraph practice set, alarm or appliance-continuity tester, employs no vacuum tubes, and is powered by only one 1½-volt flashlight cell has recently been produced by the Martin Mfg. Co., Brooklyn, N.Y.

Incorporating a high-efficiency 4-inch PM speaker, the "Vibra-Phragm" generates an adjustable 400-cycle loud tone, produces no radio or TV interference or sparking, and is completely portable.

Used with a telegraph key, it becomes an efficient, inexpensive code practice set comparable in performance to professional equipment.

For further information and a free catalog of attachments and instructions for each application, write directly to Martin Mfg. Co., 194 Gelson Ave., Brooklyn 9, N. Y., mentioning SCHOOL SHOP; *or check no. 58 on the coupon.*

New Flexible Shaft Machine

Foredom Electric Co. announces its new 900 Series flexible shaft machines which feature

exceptional versatility. They can be employed in 3 ways, hung up (thus taking up no bench space), on the bench, or mounted under the bench. In fact, the machines can be set anywhere to suit the requirements of the job at hand. A choice of 5 handpieces is afforded, pencil-size or larger, all with quick-detachable features, permitting the use of different types on the same machine.

Illustrated catalog No. 15 showing these and other Foredom models on request from Foredom Electric Co., 27 Park Place, New York 7, N. Y., mentioning SCHOOL SHOP; *or by checking no. 59 on the coupon.*

New Literature

New Meissner Radio Kits. A new illustrated four-page folder announcing the addition of five completely new radio kits which Meissner has added to its line; including the T8CK, the ever-popular Meissner FM receptor in easy-to-build kit form, and the T4AK, a 20-watt power amplifier kit. For your copy, write Meissner Mfg. Div., Maguire Industries, Inc., Mt. Carmel, Ill., mentioning SCHOOL SHOP; *or check no. 60 on the coupon.*

Bulletin 18. a new release of Handy and Harman, 82 Fulton St., New York 7, N. Y., describes a new liquid flux developed especially for use in gold and silver soldering. Write company for free copy, mentioning SCHOOL SHOP; *or check no. 61 on the coupon.*

Electrode Catalog. 16-page, 8½" x 11" electrode catalog is announced by Hobart Bros. Co., Troy, Ohio, containing a description, data on the application, welding procedure, mechanical properties and specification of electrodes in the Hobart line. For free copy, write company, mentioning SCHOOL SHOP; *or check no. 62 on the coupon.*

Vocational Books—Copyright, 1950. New release on this year's crop of D. Van Nostrand books that will interest folks in vocational education. All are 1950 books. Some have just been published; others are coming out right now; still others will be ready later this year. For free copy, write D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y., mentioning SCHOOL SHOP; *or check no. 63 on the coupon.*

Heavier Walker-Turner Power Tools. An attractive 36-page catalog describing the heavier Walker-Turner power tools for wood, metal, and plastic has been listed as available by the company. Machines listed, with complete specifications and operating conditions, include band saws, radial saws and tilting arbor saws, drill presses, jointers, lathes and shapers, air feeds, surfacers, and flexible shaft machines. For free copy of Catalog A, write Walker-Turner Div., Kearney & Trecker Corp., Plainfield, N. J., mentioning SCHOOL SHOP; or *check no. 64 on the coupon.*

Each item listed above is numbered. Check the numbers of the items you want, and mail the coupon, properly filled in, to . . .

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Ann Arbor, Michigan

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school .....

school address .....

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subject(s) taught .....

4-50

Modernized with LIMA Gearshift Drives

RECENT improvements at Ohio State University, included the modernization of many South Bend Lathes with *"selective-speed"* LIMA Gearshift Drives. A few of these machines are shown in the photo below. LIMA Gearshift Drives were selected by Ohio State because of LIMA'S *"production-line"* tested reputation for flexibility, ruggedness and stamina. If you have a drive problem, it will pay you to consult a LIMA engineer—there is one near you . . . write, wire or call for his address today.

Ohio State's completely modernized Industrial Engineering Department

• LIMA *"selective-speed"* Gearshift Drives for application to all types of machine tools and production equipment, are available in sizes from ½ to 25 hp. Write for bulletins.

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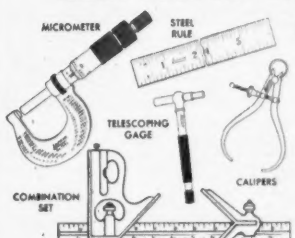

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Students become more "precision proud" when they work with genuine *Lufkin* tools. Every single *Lufkin* tool, several of which are shown above, is well designed, sturdily constructed, carefully finished, and critically inspected. It's better shop buying to specify *Lufkin*. Write, today, for the *Lufkin* Precision Tool Catalog No. 7.

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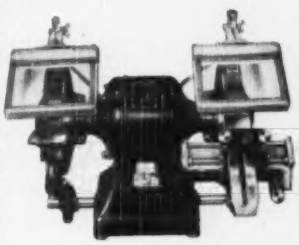
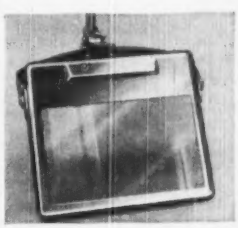
Job-size tools do a real teaching job

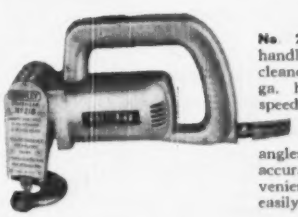
The right tools . . . the tools of industry . . . work with you to give your students industry standards. These Stanley Electric Tools make your job easier by showing your students the easiest, best way to tackle and finish each assignment. Today, write for comprehensive catalog. Stanley Electric Tools, Educational Department, 482 Myrtle Street, New Britain, Connecticut.

No. 677 BENCH GRINDER 7" x 1" WHEELS, ¼ H.P. Special motor operates at the correct, non-burning, slow speed for edge tool grinding. Equipped with fine wheel for edge tool sharpening and coarse, for general grinding. "Flud-Lite" Eye Shields, connected into grinder circuit, cannot be moved to non-guard position without dismantling. Exhaust outlets. Patented micrometer adjusting attachment for grinding plane irons up to 2⅜" wide and any width chisels. Ball bearing equipped.





NEW, LARGER EYE SHIELDS, No. 630. Stanley Eye Shields, long-time favorite in schools, are also available in a larger size. Accommodate glass 10" x 6". Conveniently located toggle switch. Shields connected into grinder circuit so that light is on only when grinder is operating. Cannot be moved to off-guard position without dismantling. For all Stanley Grinders and most other makes of motor grinders, bench or pedestal.



No. 218 UNISHEAR. Easier to handle than snips, faster and cleaner cutting. Cuts up to 18 ga. hot rolled mild steel at speeds up to 15 ft. a minute. Needs only guiding. Straight lines, curves, angles, notches with hairline accuracy. Duplex handle for convenience in any position. Blades easily replaced and re-sharpened.

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HARDWARE • TOOLS • ELECTRIC TOOLS • STEEL STRAPPING • STEEL

Index to Volume IX

All articles and projects in Volume IX (1949-50) of SCHOOL SHOP may be found in the index, listed alphabetically by both author and subject (e.g., woodworking, machine shop, etc.). Following the name of the author and the title of each article are the month of issue and the page on which the article appears.

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Akeson, Harold O. Dog Doorstop. Mar., 24.
AMERICAN VOCATIONAL ASSOCIATION—
AVA Convention at Atlantic City. Dec., 10.
AVA Holds Successful Convention at Atlantic City. Jan., 9.
Where Is Industrial Arts in the AVA? Thomas Diamond. Nov., 2.
Anderson, M. C. Demonstration Engine. Oct., 23.
———Shop Cart. Mar., 22.
Anderson, Stuart. What's Your P.Q.? Feb., 5.
AUDIO-VISUAL AIDS—
Audio-Visual Aids in Electricity Shop. Glade Wilcox. May, 8.
Blackboard Etching. Wallace I. Victoria, May, 18.
Demonstration Engine. M. C. Anderson. Oct., 23.
A Light-Weight Projector Stand. George A. Shalkhauser. Sept., 34.
Micrometer Model. Carl F. Sorenson. Mar., 22.
New Visual Aids in Industrial Education. Apr., 65.
Show Lead Screw Action With This Visual Aid. George Cunningham. Sept., 12.
Shop Math Made Easy with Visual Aids. Ira C. Madden. June, 8.
This Easily-Built Device Shows "Pitch" and "Lead." George Cunningham. Dec., 10.
AUTO MECHANICS—
Demonstration Engine. M. C. Anderson. Oct., 23.
Equipping the Auto Shop. Apr., 23.
AVIATION—
Portable Aviation Engine Stands Save Shop Space. Herbert E. Ellinger. Mar., 8.

B

Baird, Hugh, A. A Modern End Table Makes Good Project in Cabinetmaking. May, 7.
Barnard, D. P. Hitting the Highway Helps Students of Graphic Arts. Jan., 16.
Barrett, Fred, and Francis J. Gorgos. Show Students How the Spark Jumps. Dec., 18.
Billingham, G. Harold. On Guards. Feb., 18.
Brownell, Percy L. Holder Makes Good Project for Typists. Feb., 6.

C

Chatfield, William D. B4. Dec., 16.
Childers, Reuben H. Chase the Chips. Jan., 13.
Clausen, Elmer E. Pilot to Navigator. May, 18.
Connors, Albert R. Paint Brush Container. Oct., 20.
Cooney, Francis P. Tool-Crib Attendant. Jan., 12.
Cunnea, John R. Plastic Letter Opener Piques Pupil Interest. Nov., 12.
Cunningham, George. Show Lead Screw Action With This Visual Aid. Sept., 12.
———This Easily-Built Device Shows "Pitch" and "Lead." Dec., 10.

D

Diamond, Thomas. Industry Trained or College Trained? Jan., 2.
———Principles of Purchasing. Apr., 5.
———Where is Industrial Arts in the AVA? Nov., 2.
Dire tory of Federal and State Officials. Apr., 74.
Doernbrack, Henry F. They All Join In. Oct., 22.
Doose, William B. Canasta Card-Holder. Mar., 12.
———Handy Clothes Hanger. Oct., 32.
———Machine Stand. Dec., 16.
———Standardize Drawings. May, 18.
———Typewritten Tracings. Sept., 26.
DRAFTING—
Equipping the Drafting Room. Apr., 31.
India Ink Item. Wallace I. Victoria. Feb., 18.
Lettering Guide. G. Greene. Dec., 16.
A New Kind of Drafting? Herbert E. Welch. Feb., 7.
Portable Drawing Kit. George Pistolas. Sept., 20.
Solving Gear Dimension Problems in Drafting. John W. Titus. June, 10.
Standardize Drawings. William B. Doose. May, 18.
This Checking System Aids the Beginner in Drafting. Howard G. Stinisman. Oct., 18.

E

ELECTRICITY AND RADIO—
Audio-Visual Aids in Electricity Shop. Glade Wilcox. May, 8.
Converting RU-18 and RU-19 Receivers. Glade Wilcox. Sept., 14.
Dust Thou Out. Isadore M. Fenn. Dec., 16.
Equipping the Electricity Shop. Apr., 17.
Equipping the Radio Shop. Apr., 33.
Show Students How the Spark Jumps. Fred Barrett and Francis J. Gorgos. Dec., 18.
This Meter Checking System Saves Instructor's Time. Kjartan Turmo. Oct., 11.
Ellinger, Herbert E. Portable Aviation Engine Stands Save Shop Space. Mar., 8.

F

Fenn, A. E. Antique Finish. Mar., 22.
———Preserving Stencils. May, 18.
Fenn, Isadore M. Dust Thou Out. Dec., 16.
Finsterbach, Fred C. Let Students Help with Shop Maintenance. June, 11.
From Washington. Sept., 40; Oct., 48; Nov., 32; Dec., 28; Jan., 28; Feb., 32; Mar., 32; Apr., 88; May, 32; June, 32.

G

Gallington, Ralph O. Proper Maintenance Can Be Taught! Oct., 9.
Gorgos, Franc's J., and Fred Barrett. Show Students How the Spark Jumps. Dec., 18.
Greene, B. Lettering Guide. Dec., 16.
Griefzu, G. Edward, and James O. Proctor. Types of Teachers, Nov., 8; How to Teach, Jan., 9; The Supervisor Cometh, Mar., 18; Let's Take Inventory, May, 24; The Five R's, June, 9.
Griffin, Denham R. Copper Ashtray. Feb., 22.

H

Hayes, Walter O. On Guards. Feb., 18.
Haynes, Arthur V. Wrought-Iron Table. May, 6.
Healton, Clyde B. Adjustable Boring Bar. Feb., 12.
Hoopes, Paul C. Canvas Hinge. Dec., 16.
———For Men Only. Oct., 22.
———Key Blocks. Sept., 26.
———Slotting Tip. June, 18.
———A Sulphate "Solution." Nov., 20.
Hughes, Wayne P. Plan for Safety in Purchasing. Apr., 8.
Huttenga. Edward J. Foundry Program—New Style. Nov., 5.

I

INDUSTRIAL ARTS—
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Equipping the General Shop. Apr., 35.
Ford to Make Awards for Winning Projects in Industrial Arts. Feb., 22.
The Future of the AIAA. Walter R. Williams, Jr. Sept., 16.
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"One World" of Industrial Arts. Mar., 5.
Responsibilities of the State Supervisor of Industrial Arts. G. Wesley Ketcham. May, 5.
Where is Industrial Arts in the AVA? Thomas Diamond. Nov., 2.
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J

Jones, Marcellus. In the Groove. Nov., 20.
Jones, Mervyn T. Plastic Letter Opener. June, 12.
Joyce, John W. Add Catalog Uses. Feb., 18.
———A "Scotch" Burr Idea. Jan., 12.
June, Clarence A. Bandage Cutter. Nov., 10.

K

Ketcham, G. Wesley. Responsibilities of the State Supervisor of Industrial Arts. May, 5.
KINKS—
Add Catalog Uses. Feb., 18.
Antique Finish. Mar., 22.
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Blackboard Etching. May, 18.
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Flexible Bulletin Board. June, 18.
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In the Groove. Nov., 20.
Iron in the Woodshop. Mar., 22.
Key Blocks. Sept., 26.
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They All Join In. Oct., 22.
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Kissinger, J. Herbert. Democracy in School Shops. Dec., 7.
Knoop, Paul C. Elementary Printing Test. Jan., 21.
Kroll, Leonard A. Toolroom Check. Sept., 26.

L

Land, S. Lewis. Let's Evaluate Our Program! Jan., 5.
Lappin, Alvin R. Roll 'Em. June, 18.
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Lightle, R. Paul. Small Parts Cabinet. Jan., 7.
Longley, E. LeRoy. Flexible Bulletin Board. June, 18.

M

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Bandage Cutter. Clarence A. June. Nov., 10.
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Machine Stand. William B. Doose. Dec., 16.
Micrometer Model. Carl F. Sorenson. Mar., 22.
Round Stock Jig. J. W. Rocke. Jan., 12.
Show Lead Screw Action With This Visual Aid. George Cunningham. Sept., 12.
This Easily-Built Device Shows "Pitch" and "Lead." George Cunningham. Dec., 10.
Madden, Ira C. Shop Math Made Easy with Visual Aids. June, 8.
Maley, Donald. Where Do Teacher Trainers Train? Oct., 12.
METALWORK—
Antique Finish. A. E. Fenn. Mar., 22.
Canasta Card-Holder. William B. Doose. Mar., 12.
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Equipping the Metalworking Shop. Apr., 19.
Foundry Program—New Style. Edward J. Huttenga. Nov., 5.
Handy Clothes Hanger. William B. Doose. Oct., 32.
In the Groove. Marcellus Jones. Nov., 20.
A Light-Weight Projector Stand. George A. Shalkhauser. Sept., 34.
Louisville Classes Build Metal Boats. Louis H. Rogge. May, 6.
Paint Brush Container. Albert R. Connors. Oct., 20.
A Pen and Ink Holder. Emil R. Schuman. Mar., 12.
Show Your Students Metallizing. Neal P. Moore. Mar., 6.
A Sulphate "Solution." Paul C. Hoopes. Nov., 20.
Wrought-Iron Table. Arthur V. Haynes. May, 6.
Miller, H. J. Painless Paddle. Oct., 23.
Mock, Herman A. Numbered Drill Stand. Nov., 20.
Moore, Neal P. Show Your Students Metallizing. Mar., 6.
Morse, Roland D. A Versatile Glue Bench. Mar., 18.
Myers, Robert A. *et al.* Converting RU-18 and RU-19 Receivers. Sept., 14.

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Paca, Michael. From Washington. Sept., 40; Oct., 48; Nov., 32; Dec., 28; Jan., 28; Feb., 32; Mar., 32.
Pawelek, Stanley J. Brush Cleaning Made Easy. May, 12.
Pistolas, George. Portable Drawing Kit. Sept., 20.
PLASTICS—
Night Light Unites Wood and Plastic. Marvin J. Willis. Sept., 9.
Plastic Candle Holder with Poinsettia Motif. Marvin J. Willis. Jan., 8.
Plastic Letter Opener. Mervyn T. Jones. June, 12.
Plastic Letter Opener Piques Pupil Interest. John R. Cunnea. Nov., 12.
A "Scotch" Burr Idea. John W. Joyce. Jan., 12.
PRINTING—
Bookbinding in the School Shop. George Reid. Sept., 10.
Elementary Printing Test. Paul C. Knoop. Jan., 21.
Equipping the Graphic Arts Shop. Apr., 32.
Hitting the Highway Helps Students of Graphic Arts. Jan., 16.
Pilot to Navigator. Elmer E. Clausen. May, 18.
Proctor, James O., and G. Edward Griefzu. Types of Teachers, Nov., 8; How to Teach, Jan., 9; The Supervisor Cometh, Mar., 18; Let's Take Inventory, May, 24; The Five R's, June, 9.

R

Reid, George. Bookbinding in the School Shop. Sept., 10.
Robinson, Herman. An "Art" Project for Machine Shop. Nov., 9.
Rocke, J. W. Cotter-Pin Puller. Oct., 22.
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Rogge, Louis H. Louisville Classes Build Metal Boats. May, 6.

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SAFETY—
Plan for Safety in Purchasing. Wayne P. Hughes. Apr., 8.
Schellings, Joseph W. Future Sailors Train for Sea in Floating Vocational School. Sept., 7.
SCHOOL SHOP TALK—
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Action, Now! May, 2.
The AVA and Industrial Arts. Feb., 2.
Commencing Differently. Sept., 2.
Good "Shopkeepers." Oct., 2.
Hidden Costs. Sept., 2.
Ideas Are Exportable. Mar., 2.

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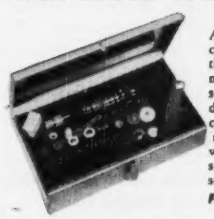

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It Warms the Cockles. Apr., 2.
It's a Man's (and Woman's) World. May, 2.
Jersey Administrators Are Educated. Dec. 2.
Let the Teachers Talk! Sept., 2.
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No Monopoly. Apr., 2.
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Where is Industrial Arts in the AVA? Thomas Diamond. Nov., 2.
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Flexible Bulletin Board. E. LeRoy Longley. June, 18.
For Men Only. Paul C. Hoopes. Oct., 22.
Key Blocks. Paul C. Hoopes. Sept., 26.
Let Students Help with Shop Maintenance. Fred C. Finsterbach. June, 11.
Painless Paddle. H. J. Miller. Oct., 23.
Paint Brush Container. Albert R. Connors. Oct., 20.
Preserving Stencils. A. E. Fenn. May, 18.
Principles of Purchasing. Thomas Diamond. Apr., 5.
Proper Maintenance Can Be Taught! Ralph O. Gallington. Oct., 9.
Requisition Hints. R. C. Stucker, Apr., 7.
Roll 'Em. Alvin R. Lappin. June, 18.
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Titus, John W. Solving Gear Dimension Problems in Drafting. June, 10.
Toews, Emil O. Underwater Welding. May, 22.
Tompkins, F. C. Shine 'Em Up! Dec., 9.
Turmo, Kjartan. This Meter Checking System Saves Instructor's Time. Oct., 11.

V

Victoria, Wallace I. Blackboard Etching. May, 18.
——India Ink Item. Feb., 18.
VOCATIONAL EDUCATION—
Foundry Program—New Style. Edward J. Huttenga. Nov., 5.
Future Sailors Train for Sea in Floating Vocational School. Joseph W. Schellings. Sept., 7.
Let's Evaluate Our Program! S. Lewis Land. Jan., 5.
Show Your Students Metallizing. Neal F. Moore. Mar., 6.

W

Welch, Herbert E. A New Kind of Drafting? Feb., 7.
WELDING—
Underwater Welding. Emil O. Toews. May. 22.
What's Your P.Q.? Stuart Anderson. Feb., 5.
Wilber, Gordon O. Industrial Arts as Seen from Coast to Coast. June. 5.
Wilcox, Glade. Audio-Visual Aids in Electricity Shop. May. 8.
Wilcox, Glade. *et al.* Converting RU-18 and RU-19 Receivers. Sept., 14.
Williams, Walter R., Jr. The Future of the AIAA. Sept., 16.
Willis, Marvin J. Night Light Unites Wood and Plastic. Sept., 9.
——Plastic Candle Holder with Poinsettia Motif. Jan., 8.
Wilson, Wade. Make Sandpaper Stick. Mar., 22.
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Bandage Cuter. Clarence A. June. Nov., 10.
Dog Doorstop. Harold O. Akeson. Mar., 24.

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Make Sandpaper Stick. Wade Wilson. Mar., 22.
A Modern End Table Makes Good Project in Cabinetmaking. Hugh A. Baird. May, 7.
Night Light Unites Wood and Plastic. Marvin J. Willis. Sept., 9.
Numbered Drill Stand. Herman A. Mock. Nov., 20.
On Guards. (1) G. Harold Billingham. Feb., 18.
On Guards. (2) Walter O. Hayes. Feb., 18.
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Small Parts Cabinet. R. Paul Lightle. Jan., 7.
Stain With Chalk. James B. Lidstone. Jan., 12.
Substitute Solvent. Sylvan A. Yager. Jan., 12.
A Versatile Glue Bench. Roland D. Morse. Mar., 18.
Wall Rack for Magazines Increases Student Use. George Shalkhauser. Nov., 7.
Yager, Sylvan A. Substitute Solvent. Jan., 12.

Washington . . . . . *from page 32*

A strong program, plus the fact that this will be the first AVA convention in the Southeast, are contributing factors to the anticipated large attendance, Dennis said.

The convention will be conducted in Miami the week of November 27.

Evidence Counts.—Value of "pressure," or, if you object to that term, choose an appropriate synonym, was clearly demonstrated last month in Washington. On Tuesday night, April 25, in the Western High School Auditorium, 1000 educators conducted a mass meeting on the need for federal aid to areas where national government activities had made a serious impact. Several members of Congress were present.

On Wednesday morning, April 26, the Bailey subcommittee of the Committee on Education and Labor approved for reporting to the full committee H. R. 7940, amended, providing financial assistance for maintenance and operation of local educational agencies in areas made overcrowded by federal activities. At the same time, the subcommittee started serious consideration of a companion bill providing for financial assistance to these same areas for school construction.

NEA Revives VE Department.—The annual convention of the National Education Association will see the beginning of plans to revitalize the association's Vocational Education Department.

Plans for a special meeting of this department of the NEA have been placed in the hands of Tracy E. Dale, Assistant Commissioner of Education for the Vocational Education Division, Missouri Department of Education, who is serving as chairman for the convention.

The vocational education group will meet at St. Louis on July 3.

According to Lyle Ashby of the NEA it is hoped that the Vocational Education Department may be revitalized to serve as liaison between general and vocational education. Ashby sees the need for such liaison and does not believe expanded activity on the part of NEA will conflict with American Vocational Association activities.

General education people, according to Ashby, need to be reminded that vocational education is an important part of the education field and vocational education people need to be reminded they are a part of general education.

Coast to Coast . . . *from page 7*

where industrial-arts classes were handled by engineering faculty and in engineering shops, little or no evidence of a personnel system was apparent. It appears that industrial-arts teacher education needs to look rather critically at the extent to which it is achieving this aspect of its purposes.

Interest in the Recreational Aspects

Some psychologists have held that one of the most important outcomes of industrial-arts activities relates to the opportunity afforded for recreation. Most children and youth enjoy working with tools and materials, and given the opportunity, will engage voluntarily in constructive activities. The writer was interested in noting, therefore, the extent to which activities of a type which usually appeal to young people were evident in the college classes.

While some schools still cling to the

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rather traditional types of activities and stereotyped projects it is encouraging to see that many others are moving increasingly toward projects and activities in which there is a natural interest. For example, one finds classes making fishing rods and tackle, snowshoes, skis, boats, model airplanes, scooters, soapbox racers, archery equipment, tools and machines for the home workshop, and a wide variety of craft articles.

As the industrial-arts profession moves further away from its blind worship of the process and operation, and becomes more fully aware of its obligation to achieve the many objectives to which it subscribes, there will be more and more such activities as those described above, which will contribute directly to the recreational needs of all youth.

And so the writer returns home with the firm conviction that the industrial-arts profession is definitely looking forward, but also with the feeling that it is not in all cases meeting the great challenge which lies before it. Some of the pressing problems appear to be the need for greater breadth and richness in laboratory experiences for prospective teachers, a greater emphasis on teaching students to think and plan, a concerted effort to encourage industrial arts at the elementary level, and also to make industrial arts available to girls as well as boys.

And rising above all other considerations is the writer's great sense of obligation to all of the heads of department and faculty members.

Maintenance ..... *from page* 11

tions basis only); *Repair Work*, repair and maintenance of shop equipment; *New Construction*, planning and construction of new units; *Record Work*, printing forms, lettering signs, etc.

The development of the student in terms of character building, sense of responsibility, participation in a common task for the common good, should transcend such conveniences as personal work and/or janitorial considerations. No one janitor can ever clean and maintain a shop as well as 24 students working cooperatively. The student participation can supplement the janitorial work. It is then easier to persuade the janitor to refinish the shop floor annually, or to clean outside of windows more frequently and to do work ordinarily neglected because of daily pressure of routine jobs. In every case where this approach was used by the author, the janitor has, in turn, been very cooperative.

It is of further value for the teacher to keep cumulative records of the time spent by students and himself on maintenance work. Many administrative officials do not appreciate fully the vast amount of personal supervision that must be given to the shop maintenance on the part of the teacher. Clear records, accurately kept, often carry more weight than personal opinion when teaching loads and preparatory time are discussed.

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FROM WASHINGTON

SCHOOL SHOP WASHINGTON BUREAU

Congress Says "No."—Chances that funds will be made available to add vocational education programs in 2985 high schools appear dim. The House Appropriations Committee declined to provide $3,457,210 to the funds under the George-Barden and Smith-Hughes acts, and the House itself sustained its committee.

While vocational-education leaders are hopeful the Senate will be more generous, the incentive for a Senate fight for the full amount requested in the President's budget is slim. No effort was made to restore these funds in the House.

Normally the Senate is considered to be more generous than the House; but the Senate is reluctant to disturb House-approved cuts when no fight was made on the floor.

Had a floor fight been made, the Senate would have been led to believe the increase had backing in the House and that its chances of remaining in the bill after conference might be good. When no fight is made on the floor, Senators are generally inclined to feel that it is better to go along with the House.

The same fate is undoubtedly in store for the request on the part of the U. S. Office of Education for $55,000 to experiment with a program looking toward preparation of guides and manuals for apprentice training in public schools for 291 occupations.

Not only was no fight made on the floor for this item, the Committee knocked it out without making any reference to the request in its report to the House.

In fact, the nearest to a fight made on the section of the huge single-package appropriation bill dealing with education was when Representative Vito Marcantonio (A-L, N. Y.) made his usual motion to ban grants to educational institutions practicing racial segregation. Representative John Rankin (D., Miss.) made his usual point of order, was overruled, and Marcantonio's motion was defeated 17 to 49.

AVA to Promote Industrial Arts.—A revitalized program designed to involve as many industrial-arts people as possible is being advanced by the Industrial-Arts Section of the American Vocational Association, according to AVA Vice-President Roy Fales.

Mr. Fales told SCHOOL SHOP that the section proposes a program of much greater activity that will be attractive to greater numbers of people.

Part of the rejuvenation involves more attention to letting members, and prospective members, know what is being done.

A strong program at the AVA convention in Miami also is on the agenda.

Looking toward the new program, Fales has met with the cabinet group of the Industrial-Arts Planning and Program Committee for a complete review of the industrial-arts situation in this country. Reason for the meeting, according to Mr. Fales, was "to see what could be done to stabilize, strengthen and develop the industrial-arts situation."

Present at the meeting, in addition to Fales, were the following:

Verne Pickens, Kansas City; John Ludington, U. S. Office of Education; Stanley Pawelek, Baltimore; and S. L. Coover, of California, Pa. AVA President Frank Moore and Executive Secretary L. H. Dennis sat in on the sessions. Chris Groneman of Texas, a member of the committee, was unable to be present.

Among other things, the Committee made recommendations for membership on AVA committees on research, on publications, and on resolutions. Pending approval and acceptances, however, the recommendations were not revealed.

Development of suitable publication material for SCHOOL SHOP, *American Vocational Journal*, and other publications, was discussed at some length.

AVA Stays Put 'til September.—Although the subject has been discussed at some length, the American Vocational Association is not contemplating an immediate or early change in the address of its Washington office from its present location in the Denrike Building, 1010 Vermont Ave., N. W.

It has been reported the office of AVA headquarters would move to the new building of the American Council on Education.

According to Executive Secretary L. H. Dennis, the move, if any, probably won't come until September. That is when the present lease expires. Final decision on moving is expected to be reached by that date.

SCHOOL SHOP was told that if a move is made, it will be to offices in the general locality of present headquarters. The American Council has its offices within four blocks of AVA.

Florida Beckons.—Advance indications are that the AVA convention in Miami this fall will be a real sell-out, according to Executive Secretary L. H. Dennis.

Hotel reservations already have been received from 28 states, Canada, and Hawaii, Dennis said. From the early reservation requests, from letters expressing interest, and from "other indications," Dennis predicts the meeting will attract more than 3000 vocational educators.

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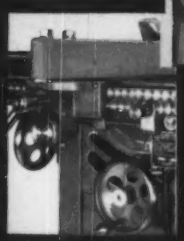

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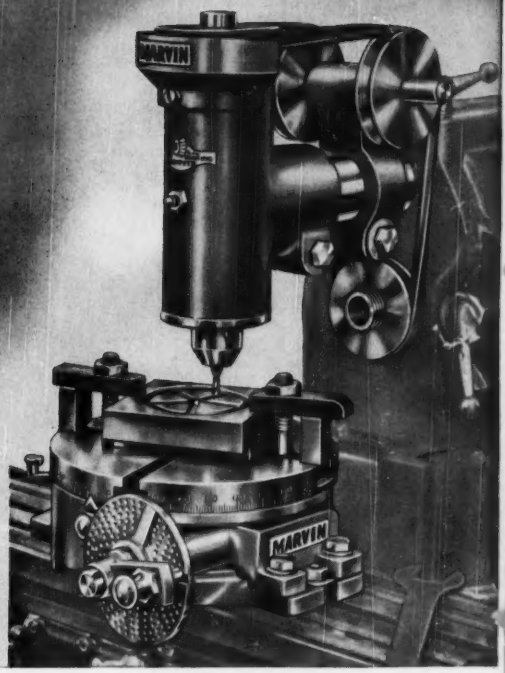

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